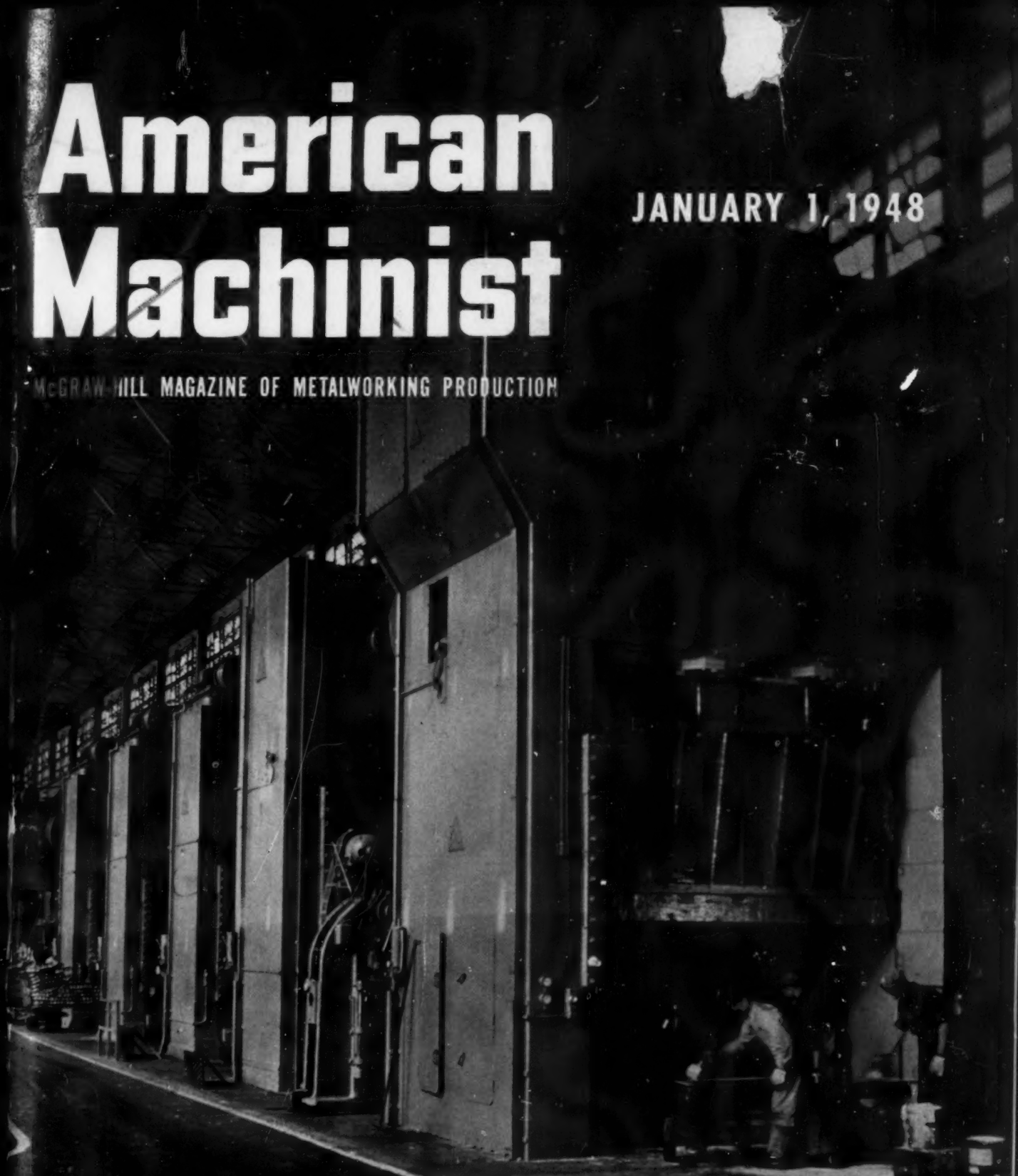
American Machinist

JANUARY 1, 1948

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



- HOW THE JEEP DONNED CIVVIES
- VERTICAL SURFACE BROACHING ... a special report
- TRICKY TOOLING CUTS RELAY COSTS

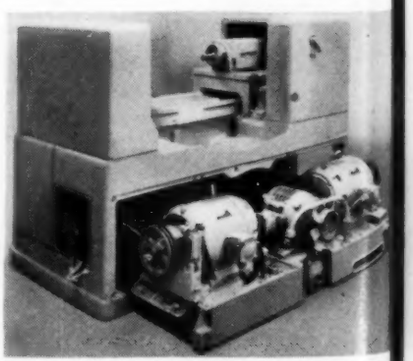
Another *COMPLETELY NEW* Heald Bore-Matic with Double-End Capacity!

• **Faster cycles. Constant speeds. Simplified operation.** These and many more exclusive features make the Heald Model 322 a *completely new* Double-End Bore-Matic—compact in size, but big in capacity.

Borize your medium-size parts on it. It does more in a minute than you ever imagined. Arrange it with multiple spindles at either end for large, awkward work. It bores, turns, faces, chamfers, grooves, fly cuts—with greater power in the cutting and a higher precision in the finish.

The Model 322 is only one of an entirely new line of Heald precision finishing machines—Bore-Matics, Internal Grinders, Surface Grinders—eighteen in all, and each one completely new. There are years of engineering experience behind them—years of uninterrupted, cost-cutting production ahead. The Heald branch office in your part of the country will be glad to give you complete details.

SEND FOR BULLETIN on this Heald Model 322 Bore-Matic and on its smaller double-end partner, the Heald Model 222.



Rear view of Model 322 Bore-Matic shows hydraulic power unit rolled out for easier maintenance, large built-in pan for chips and cutting fluid, electric control box top right.

HEALD

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

CONTENTS for January 1, 1948

VOL. 92, NO. 1

ADMINISTRATION

Editorial ..... *Burnham Finney* 67
Guards or Production? ..... *Round Table* 102

SPECIAL REPORT

Vertical Surface-Broaching Fixtures—1 ..... *Ben Brosheer* 77

ENGINEERING

How the Jeep Donned Civvies ..... *Delmar G. Roos* 69
What to Look for in Hydraulic Oils—5 ..... *Anthony J. Zino, Jr.* 96
Wiring for Electric Motor Circuits ..... *(RBS)* 127

MATERIALS HANDLING

Handling Spells Economy at Power Saws ..... *Benjamin Melnitsky* 74
Tandem Press Loader Uses Air Cylinder ..... *Joseph F. Budnick* 104

MATERIAL CUTTING, FORMING

Short Cuts ..... *A. H. Waychoff* 76
Shop Shots at Studebaker 100
Six Hex-Heads Milled in Three Passes ..... *Robert Mawson* 106
Light Shows Follower Contact ..... *Earl Goodman* 107
Auxiliary Vise Clamp Prevents Slipping ..... *Nels A. Malmgren* 107
Rules for Upsetting Bar Stock ..... *(RBS)* 123
Rules for Upsetting Tubing ..... *(RBS)* 125

TOOLING

Tricky Tooling Cuts Relay Costs ..... *Paul Bonness* 93
Button Holders Solve 'Impossible' Layouts ..... *Federico Strasser* 103
Openside Toolholder Allows Closer Facing ..... *Arthur Morton* 104
Azimuth Plate Rechecks Dividing ..... *Fay E. Clarke* 104
Rubber Jaws Hold Many Pieces ..... *A. F. Scoblic* 105
Sheet Metal Held Flat in Telescoping Vise ..... *C. D. Mackinnon* 105
Shaft-Drilling V-Block ..... *Gosta Mattson* 106
Milling Machine Column Pointer Resets Table Height ..... *J. Cuyler* 106
Old Drills Make Good Counterbores ..... *Raymond K. Stryker* 106
Lathe Chuck Holds Balls ..... *L. H. Hardcastle* 107
Bayonet Chuck ..... *Henry G. Berndt* 108
Small Thrust Collars Save Shaft Space ..... *Martin H. Ball* 108
Dowel Aids Square Grinding ..... *Howard DeHeer* 108

NEWS OF METALWORKING

Spot News 65
Gaging Business 112
Detroit News 113
Names in the News 119

DEPARTMENTS

Reference Book Sheets 123
Shop Equipment News 129
Parts and Materials 144
Round Table Discussions 146
New Books 156
Fictionary 164

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VR v.92 Jan.–Feb. 1948

Chips and QUIPS

Our Cover . . . Willys-Overland's $5-million stamping shop, put into operation only four months ago, is now tooled up to produce the bulk of the major stampings for the company's line of trucks. Eventually, the shop will produce all bodies for the complete Willys-Overland line, including recently announced cars. Until August, Hayes Mfg. made truck stampings, and panel-delivery stampings until October. Hayes still makes station-wagon bodies, American Central those for the Jeep.

Modern in every detail, including dynamic coloring, the division already includes 53 presses and consumes 8,500 tons of sheet steel a month. Presses are installed on a steel superstructure (for ready relocation) in a concrete and steel pit 700 ft. long and 20 ft. deep. The building itself is a remodeled 135,000-sq. ft. structure, on which the roof was raised 12 ft. to clear the larger presses—one 47 ft. tall.

There are five main Clearing press lines, ranging from a 1,400-ton capacity triple-action unit weighing 300 tons to a 160-ton single-action unit. Banks of smaller Bliss, Niagara and Thomas presses turn out brackets and other small stampings. Presses are located so parts are stamped in the order in which they are assembled. Scrap goes by basement conveyor to a baler; finished parts are washed before assembly.

One end of the 600-ft. shop is a sheet stores, served by a 40-ton, and 10- and 15-ton cranes which deliver steel from an adjacent railroad siding to gravity roll conveyors. Shears in this area cut sheet to exact size. Major dies are made outside, smaller ones in the plant die maintenance shop.

Our Kodachrome shows a major press line, with the orange parts-handling trailers in the background. They are Jeep-towed as needed.

Broaching Fixtures . . . Almost a year ago, Ben Brosheer, our Western Editor, began collecting information on fixtures for surface broaching. Persistent digging brought out such a wealth of material that we were forced into not one, but *two*, special reports on vertical surface-broaching fixtures alone. You'll find the first half of this handbook herewith, the rest in Jan. 15.

Materials Handling . . . For those readers interested in material handling, we have a picture story on handling at the power saws and a couple of pictures of handling devices at Studebaker. A great number of stories in earlier issues also treat this subject, vital because of dawning appreciation of the tremendous costs of handling materials and work. If this problem is in your bailiwick, don't forget the Materials Handling Show in Cleveland later this month.

Coming . . . Rip Van Winkle walks again, yawning, in *A.M.* for Jan. 15—an appeal for you to watch your organization to see that some native of Sleepy Hollow doesn't let you get caught napping.

JAMES D. MOONEY

MAN OF PARTS . . . James D. Mooney, president and chairman of the board of Willys-Overland Motors, is an editor who made good. Born in Cleveland in 1884, he has his B.S. and M.E. degrees from Case, was a mining engineer in the Rockies, an engineer for Westinghouse, associate editor of *A.M.* (1912), application manager for Goodrich on conveyor belts, and general sales manager for Hyatt Roller Bearing before he became an artillery captain in World War I.

Later, he became president and general manager of Remy Electric, and in 1921 general manager of General Motors' export company. A year later he was president and a G.M. vice-president and director. He established several overseas manufacturing plants and 25 assembly plants all over the world, and in 1940 was transferred to chair a special group of G.M. directors handling conversion of company plants to arms production. A year later, he was ordered to active duty as a Navy Lt. Cmdr. to head the Production Engrg. Section, Bureau of Aeronautics. He was promoted to Captain while in service with the 11th Amphibious Force in England, later to the staff of the Chief of Naval Operations. He returned to G.M. in 1945 to overseas duties, resigned a year later to head Willys-Overland.

JEEP DESIGNER . . . Delmar G. (Barney) Roos was the boy who wanted to design locomotives; instead he has engineered a long line of autos and Army vehicles. As vice-president in charge of engineering, Willys-Overland Motors, he believed in the Jeep in 1940, when it was little more than an ironing board on wheels and called the "belly flopper." Born in New York City in 1887, Mr. Roos received both M.E. and E.E. degrees from Cornell, as well as the intercollegiate fencing title.

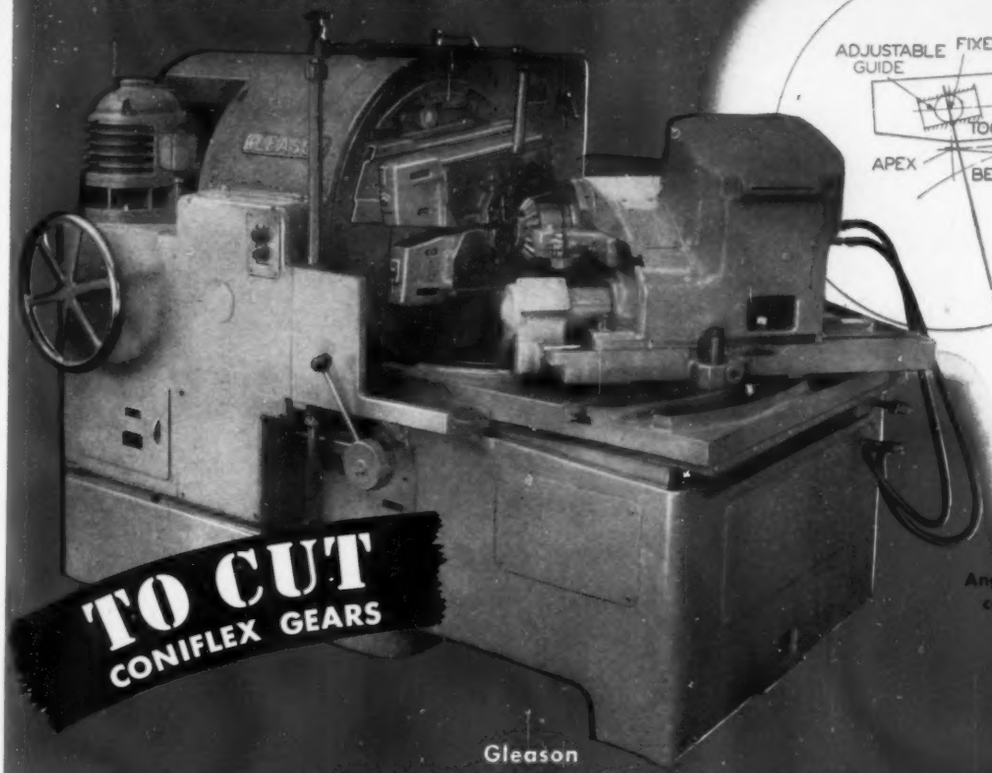
His first job was with G.E., his second on electrical starting and lighting for Locomobile. In 1920, Mr. Roos studied European postwar developments for 8 mo., then shifted to Pierce-Arrow to fix up a failure, then back to Locomobile under Durant to design the Junior 8. When Durant collapsed, Roos went to Marmon, where he designed several cars and worked on the straight-8 engine. From 1926 to 1937 he was with Studebaker, latterly as chief engineer and engrg. v.p., then spent a year in England as Studebaker consultant. He returned to the U.S. to join Willys in 1938, beginning the work on a light car which has flowered as described in our lead article.

DELMAR G. ROOS

Tech

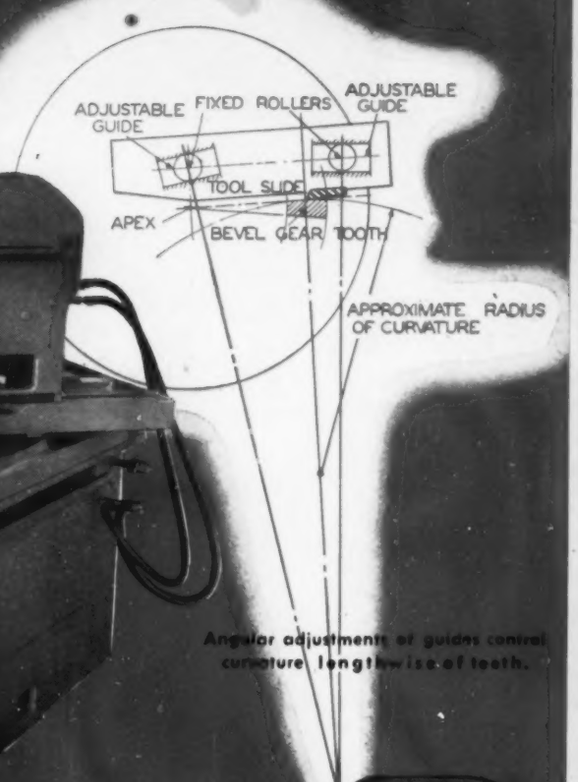
TO PRODUCE BETTER CONIFLEX* GEARS *The New, Easy Way...*

USE A COMPLETE UNIT OF GLEASON BEVEL GEAR EQUIPMENT



TO CUT CONIFLEX GEARS

Gleason
No. 14 Straight Bevel Generator



Angular adjustments of guides control curvature lengthwise of tooth.

The new Gleason No. 14 Straight Bevel Generator, through simple angular adjustments of rollers and guides, (see sketch) automatically produces localized tooth bearing in Coniflex* gears in any desired amount.

* Coniflex—Straight bevels with localized tooth bearing. Reg. U. S. Pat. Off.

TO TEST CONIFLEX GEARS

Gleason
No. 13 Universal Tester

TO SHARPEN CUTTING TOOLS

Gleason
No. 12 Generator
Tool Sharpener

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1000 University Avenue
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over Eighty Years

A NEW IDEA IN

. . . four automatic milling machines on a common base

It's work, hard work, to figure out new cost reduction ideas in machining operations on small parts. But you won't have to cudgel your brain to see the possibilities offered by the new CINCINNATI 000-4. It's an automatic milling machine for high production work, with one, two, three, or four units, as required, mounted on a single base.

Each unit is independent in regard to the automatic table cycles, the feed rates, and the spindle speeds.

Each unit can be set up for the same milling operation or for a sequence of operations. Automatic loading fixtures can readily be devised, and our application engineers are at your service to help you. One man can operate this four-in-one machine.

BRIEF SPECIFICATIONS

Table working surface	5¼ x 13⅜ in.
Table travel	4 in.
Feed rates	1 to 40 in. per min.
Spindle speeds, infinite	300 to 1800 rpm

Would you like to know more about the new CINCINNATI 000-4 Unit Type Automatic Milling Machines? Ask for publication M-1622.

CINCINNATI

THE CINCINNATI MILLING

MILLING MACHINES

HIGH PRODUCTION MILLING

CINCINNATI No. 000-4 Unit Type Milling Machine. Complete information may be obtained by writing for catalog M-1622.

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BROACHING MACHINES • CUTTER SHARPENING MACHINES

1948 Economies in

69* PER HOUR

No. 10 Rotary Gear Shaper

On Two Gears Like These ...Plus Fellows

RING GEAR SPECIFICATIONS

Number of teeth	79
Diametral pitch	16
Pitch diameter	5.1313"
Pressure angle	20°
Face width (each section)	1¼" (Approx.)
Helix angle	15°-47'-43"
Backlash	.000"-.002"

*Ring gear cut in two operations. Estimated time on 10 spindles, 69 per hour for each setting including set-up and removal of work.

Ask for further time studies and specifications on the No. 10 Rotary Gear Shaper.

GEAR SHAPERS · THREAD GENERATORS · CUTTERS · SHAVING AND BURNISHING MACHINES

Mass Production

129
PER HOUR

SPECIFICATIONS OF SUN GEAR AND PLANET PINIONS

Number of teeth	28
Diametral pitch	16
Pitch diameter	1.8187"
Pressure angle	20°
Face Width	1⅛" (Approx.)
Helix angle	15°-47'-43"
Backlash	.004" to .006"

Planetary Gear Shaper

†Estimated production on 6-station Planetary Gear Shaper including set-up and removal of work.

Ask for a new bulletin of time studies and specifications on the Planetary Gear Shaper.

Great Gear Shapers

Can be Produced at Record Speeds

Precision

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CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Catalog G-574, containing engineering specifications, will be sent on request.

CINCINNATI GRINDERS

CENTER TYPE GRINDING MACHINES

New CINCINNATI

FILMATIC

No. 2 CENTERLESS

reduces precision grinding cost in two ways!

CINCINNATI

To pay today's price of survival, you can't afford to overlook a single item of cost reduction. And in the field of precision grinding, the new CINCINNATI FILMATIC No. 2 Centerless offers two approaches to lower cost:

1. *Reduced maintenance expense.* Built-in, oil-shot lubrication for the slides . . . FILMATIC bearings for both wheel spindles, with automatic lubrication . . . built-in electrical controls protected by hinged cover with safety interlock handle.

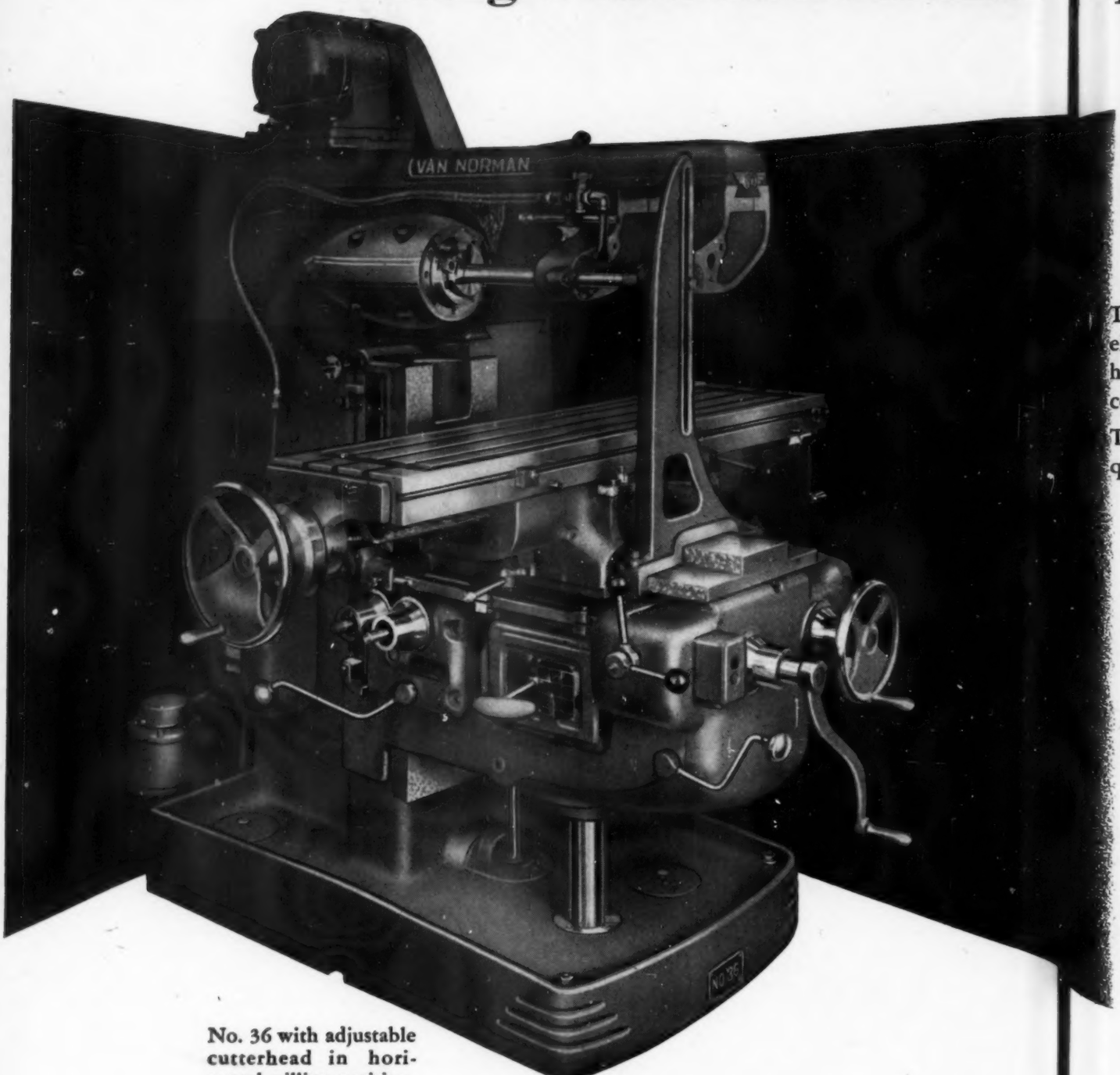
2. *Time-saving set-up features.* Swivel mounting of regulating wheel slides . . . choice of fixed or sliding work rest mount for infeed grinding . . . adjustable rate, hydraulic truing over the grinding wheel . . . lightweight, easily removable wheel guard cover.

Of course, the new CINCINNATI FILMATIC No. 2 Centerless offers many other advantages. You may obtain complete information by writing for catalog G-574.

INCORPORATED CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

A Single Investment that



No. 36 with adjustable cutterhead in horizontal milling position. Table: 64 x 14 inches

Van Norman Ram Type Millers are available in 7 Sizes — 18 Models. A Size and Model for every milling requirement.

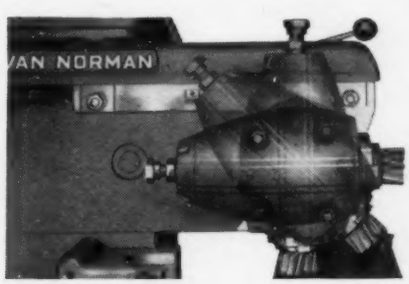
"It pays to Van Normanize"

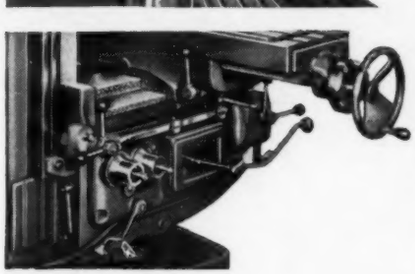
Pays for Itself 3 ways ...

VAN NORMAN
Ram Type Milling Machine

The Van Norman Ram Type Milling Machine quickly pays for itself through time saved in set-ups, elimination of idle machine time and increased production. Not only does it perform conventional horizontal, angular and vertical milling, but it enables operators to carry most jobs through to completion without work reset-ups.

The Van Norman Ram Type Miller is available in many models... a machine to fit every requirement in the tool room, machine shop, pattern shop, laboratory or production department.





1. Adjustable Cutterhead

permits conventional horizontal, vertical, as well as angular milling with standard arbors and cutters. This feature reduces set-ups, eliminates idle operator and machine time because there is no waiting for single purpose machines.

2. Moveable Ram

on which the cutterhead is mounted, in combination with the saddle cross-feed, increases the versatility and capacity of the ram type miller. This feature permits the operator to handle larger and unusual work pieces with relative ease and minimum set-ups.

3. Ease of Operation

and convenience of control speed-up milling operations. All power controls, on all machines except smaller models, are located at both front and rear. Dual controls of power feeds reduce worker fatigue, provide maximum safety. These controls are directional—operate in the direction of desired table, saddle and knee movement.

These and other features make the Van Norman Ram Type Miller the most versatile, cost cutting machine available. Write for information.

VAN NORMAN COMPANY

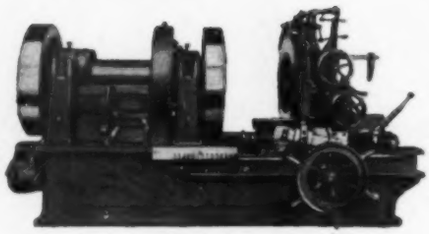
SPRINGFIELD 7, MASSACHUSETTS

Better Threads by Landis Methods

LANDIS

CUTTING

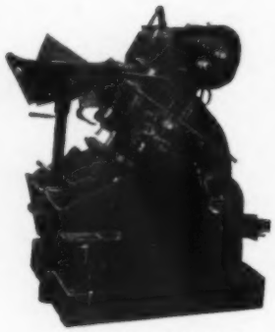
Bolt and Pipe Threading Machines. Threading Heads for Turret Lathes and Automatic Screw Machines. Equipment designed either for high production work or for jobbing and maintenance operations. An important feature of this equipment is that it uses the Landis Tangential Chaser, whose free cutting action has often caused it to be acclaimed "The Finest Thread Cutting Tool in Industry."



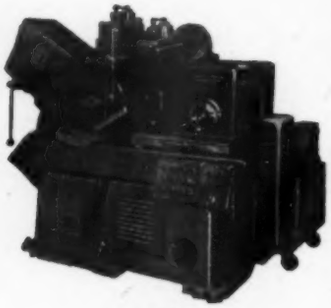
PIPE THREADING & CUTTING-OFF MACHINE

GRINDING

The Centerless Thread Grinder for grinding screw threads on straight cylindrical workpieces and headed or multiple diameter parts by either the thru-feed or in-feed methods. It can be used for grinding threads from the solid as well as for finish grinding of precut threads, the choice of method being determined by the workpiece and thread specifications.



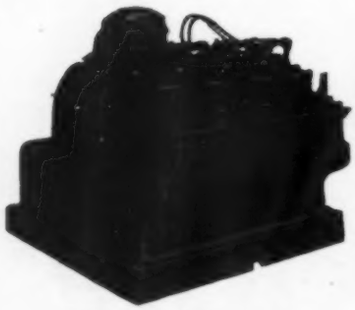
AUTOMATIC FORMING & THREADING MACHINE



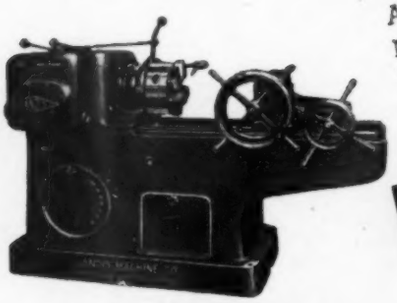
CENTERLESS THREAD GRINDER

ROLLING

A fast and economical method of generating screw threads. The Landis Roll Attachment, for producing straight threads, is designed for Automatic Screw Machines. It provides for processing threads which would otherwise have to be handled as a secondary operation.



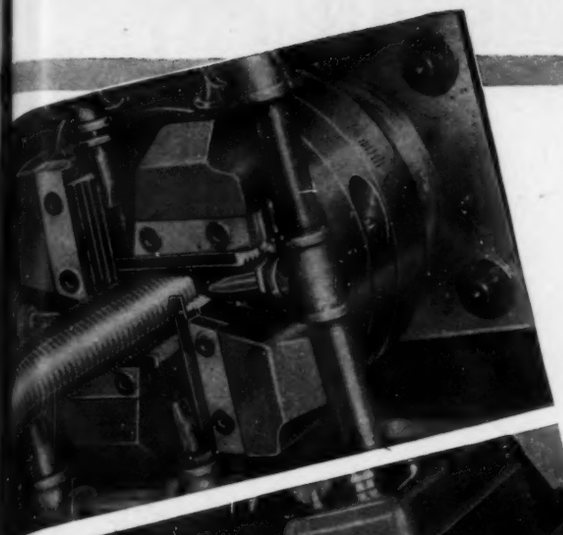
4-SPINDLE SEMI-AUTOMATIC

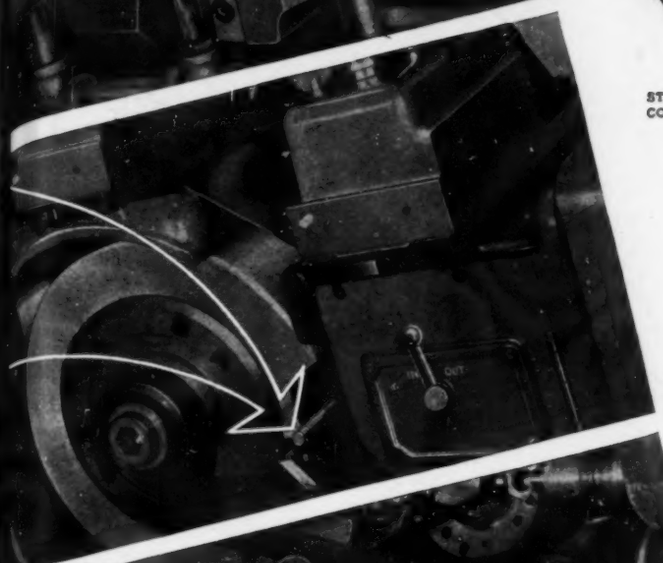


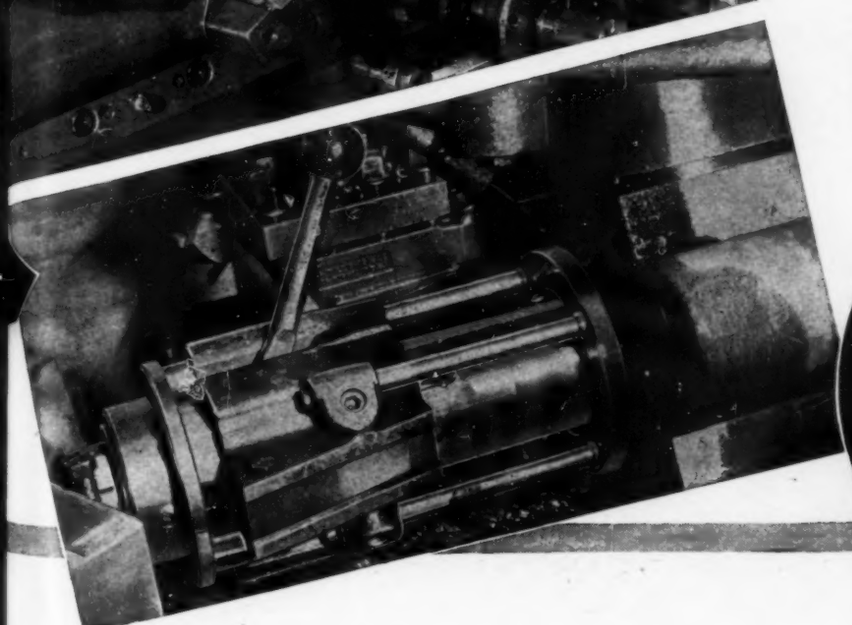
LANDMACO THREADING MACHINE

TAPPING

Collapsible and Solid Adjustable Taps for tapping straight and tapered threads—held within National Screw Thread and API tolerances.







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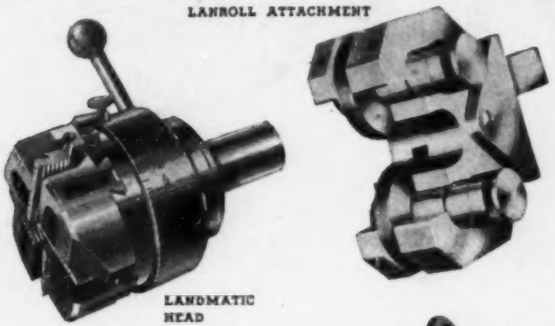
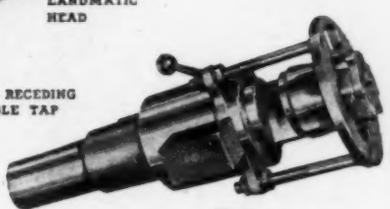
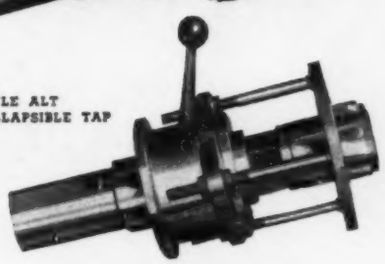


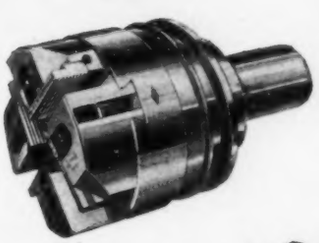
LANDMATIC HEAD

STYLE LL RECEDING COLLAPSIBLE TAP



STYLE ALT COLLAPSIBLE TAP





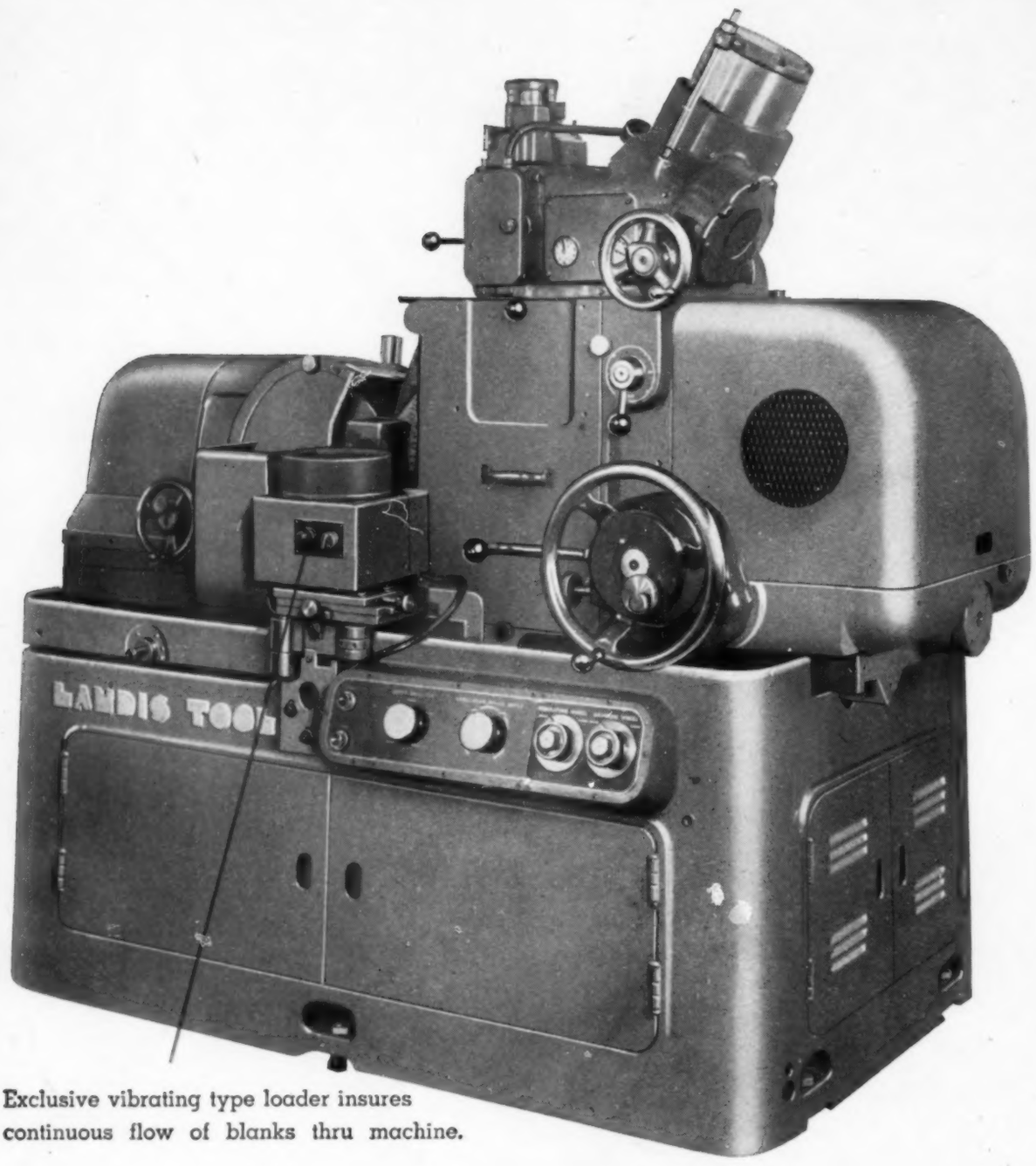
LANDEX HEAD

THE LANDIS CHASER

LANDIS Machine COMPANY
WAYNESBORO
PENNA., U.S.A.

Exceptional Production and Accuracy

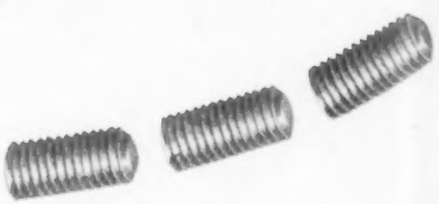
with centerless thread grinder



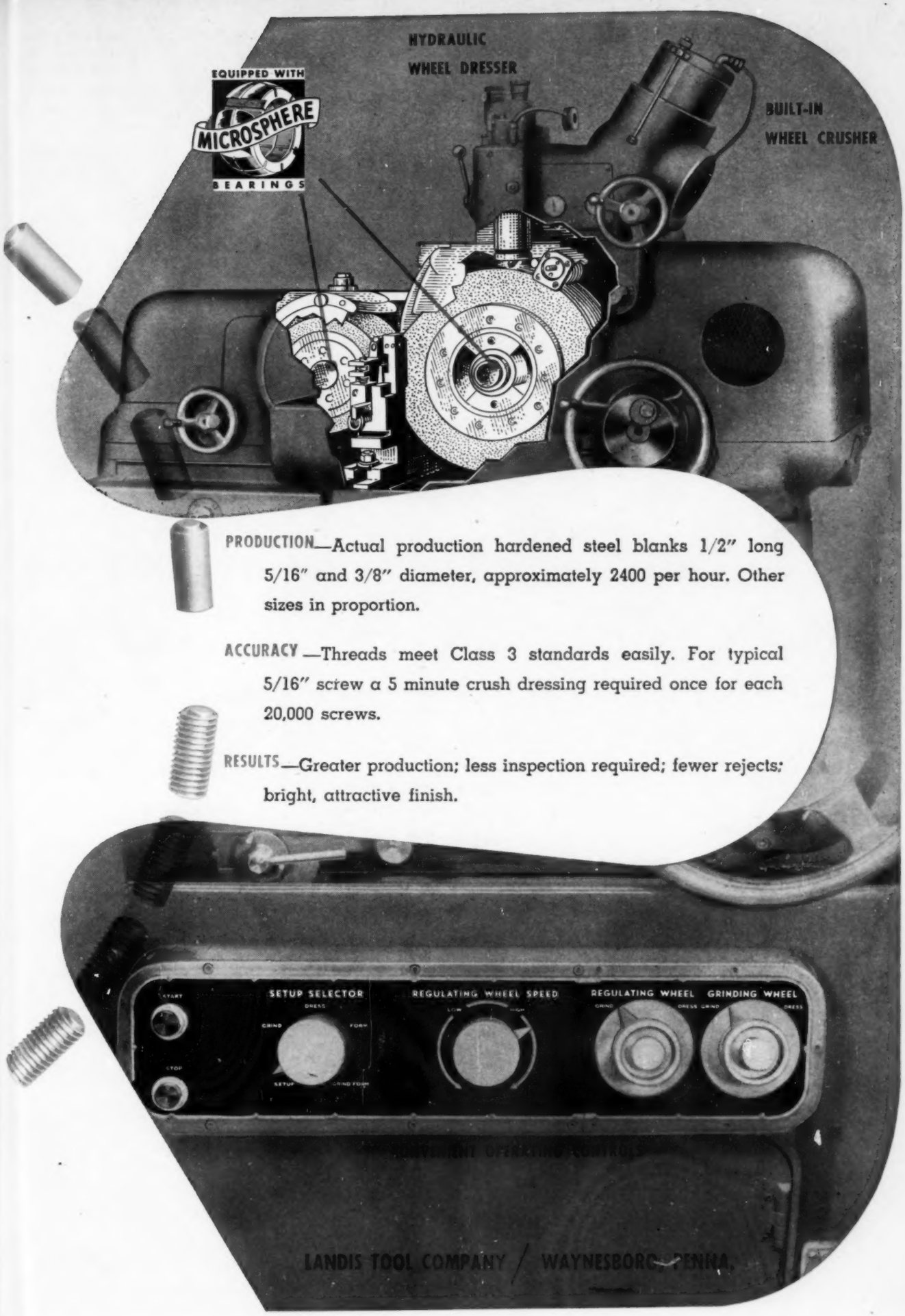
Exclusive vibrating type loader insures continuous flow of blanks thru machine.

LANDIS TOOL
Precision Grinders

77



Production estimates and tooling suggestions given on the basis of your blueprints.

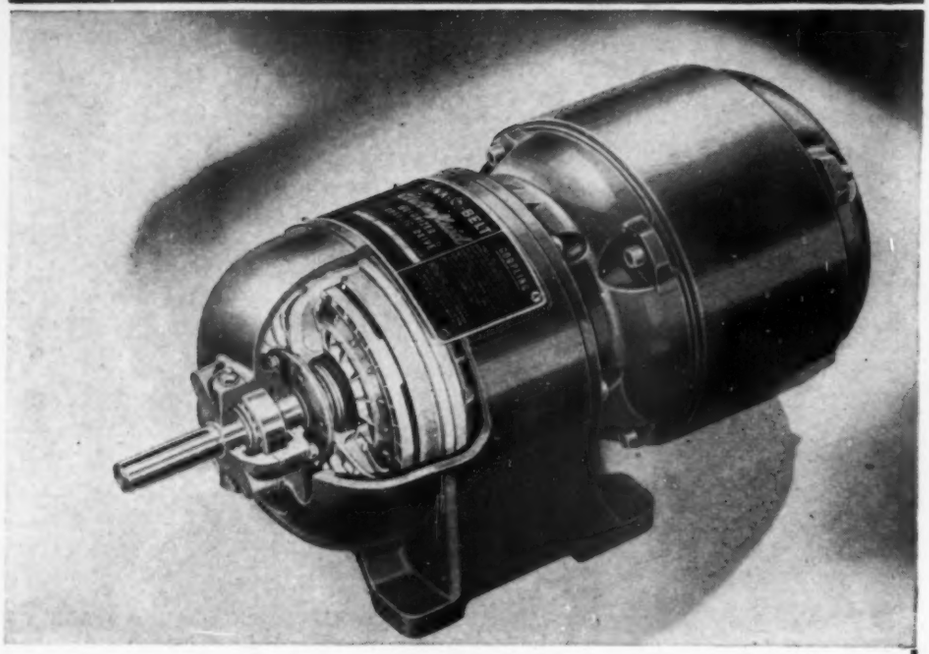


PRODUCTION—Actual production hardened steel blanks 1/2" long 5/16" and 3/8" diameter, approximately 2400 per hour. Other sizes in proportion.

ACCURACY—Threads meet Class 3 standards easily. For typical 5/16" screw a 5 minute crush dressing required once for each 20,000 screws.

RESULTS—Greater production; less inspection required; fewer rejects; bright, attractive finish.

TAKE *SHOCK* OUT OF TOUGH DRIVES WITH LINK-BELT *Electrofluid* DRIVE



"MOTORIZED HYDRAULIC POWER" *ASSURES* CONTINUOUS TROUBLE-FREE OPERATION!

The Electrofluid Drive combines with virtually all types of Link-Belt constant and variable speed reduction gear units and chain drives to afford shock-proof, efficient, economical transmission of power, embodying important features in starting and overload protection. Three principal advantages are:

(a) It permits the use of a smaller motor than otherwise might be required—improves power factor and overall efficiency.

(b) It prevents damage to costly power-driven equipment and motor.

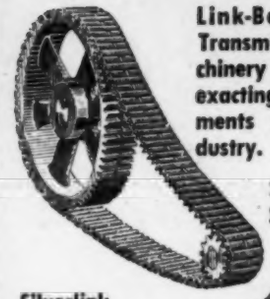
(c) It provides a smooth transmission of power, eliminating shocks which could damage material in process.

Ask for Book 2085-A giving full details and application suggestions.

10,738-A

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.



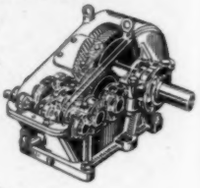
Link-Belt Power Transmission Machinery meets the exacting requirements of all industry.

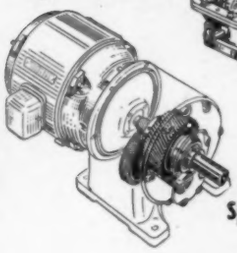
Silverstreak Silent Chain Drives

Silverlink Roller Chain Drives

V-Belt Drives

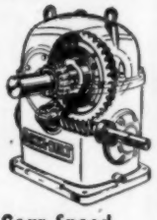
Herringbone Gear Speed Reducers

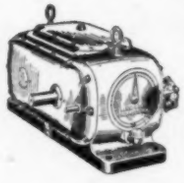




Motorized Helical Gear Speed Reducers

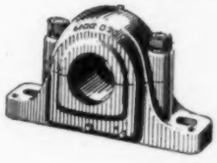
Gearmotors





PIV Gear Speed Changers

Ball Bearing Mounted Units



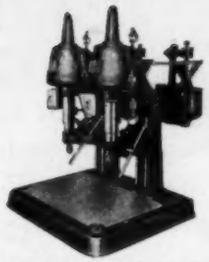
Roller Bearing Mounted Units

Unmounted Ball and Roller Bearings

Babbitted Bearings

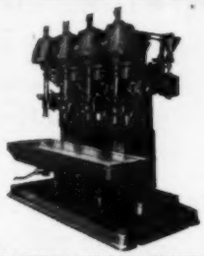
THE SYMBOL OF QUALITY LB LINK-BELT

LINK-BELT *Power Transmission Machinery*

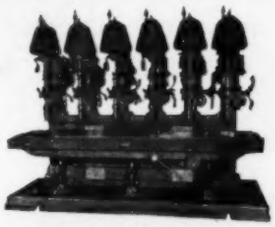


2-SPINDLE 16" NO. 5-10,000 B. V. BENCH DRILL

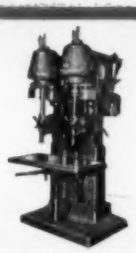
14" NO. 3000 F. V. SENSITIVE FLOOR DRILL



4-SPINDLE 21" BOX COLUMN SLIDING HEAD FLOOR DRILL

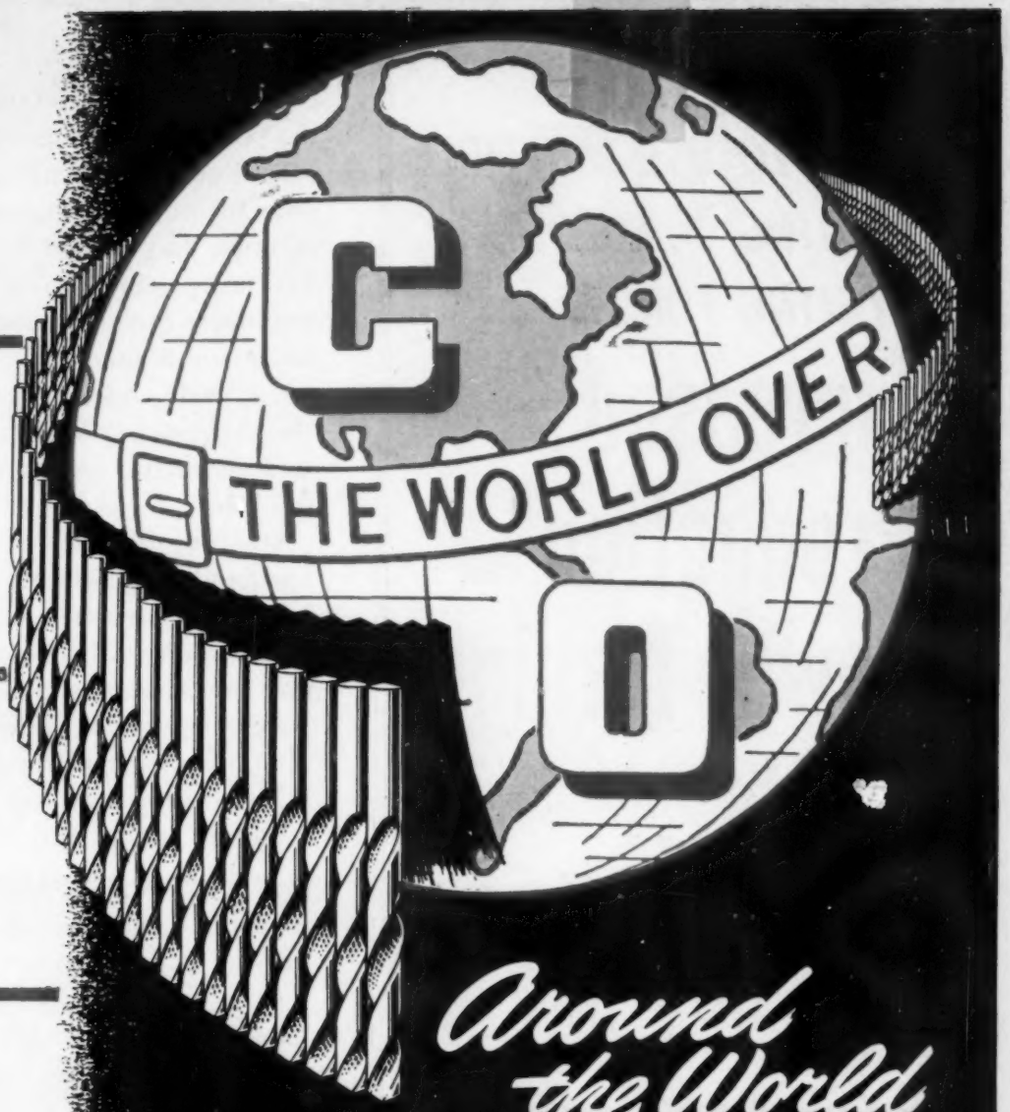


6-SPINDLE 21" BOX COLUMN SLIDING HEAD FLOOR DRILL



2-SPINDLE 21" BOX COLUMN SLIDING HEAD FLOOR DRILL

21" BOX COLUMN SLIDING HEAD FLOOR DRILL



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CANEDY-OTTO provides *the world's most complete drill press line* for you to choose from — each unit a product of 54 years experience manufacturing drill presses. You can buy *all* your standard drill presses from this one source, benefitting throughout your plant from the finer precision performance built into every CANEDY-OTTO Drill Press. Do not fill any drill press needs before reviewing the fully illustrated, detailed, CANEDY-OTTO catalog. Get your copy now.

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HOW TO USE MULTIPLE TOOLING & AUTOMATIC CYCLING FOR...

Increased Production and Lower Turning Costs...

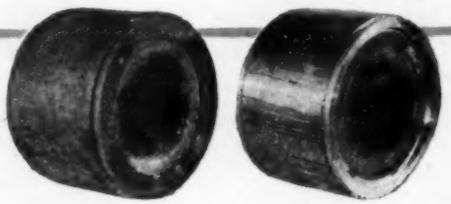
Here are three typical turning jobs that illustrate the versatility of Sundstrand Automatic Lathes. You'll note that it makes no difference whether your turning problem is a mass production job running into thousands of pieces . . . a short run of a few pieces . . . or a special turning job, our engineers can show you how to do it *better* and *faster* on Sundstrand Automatic Lathes with quick cycle changeover. *And,* you'll get all of the time saving advantage of multiple tooling and automatic cycling on practically any turning job.

Most turning jobs can be handled with *standard* Sundstrand lathes. However, when the nature of the work is such that these standard machines cannot be tooled to handle the part, our engineers design special attachments or if necessary special lathes to get the most profitable processing method for the job at hand.

Before you buy *any* turning equipment, investigate Sundstrand Automatic Lathes.

MORE TURNING FACTS FREE. This free 44-page booklet contains helpful tips on processing turning jobs, together with illustrations and tooling diagrams. Complete engineering and production data are given on many jobs similar to yours. Write for your free copy today. Ask for bulletin 167.

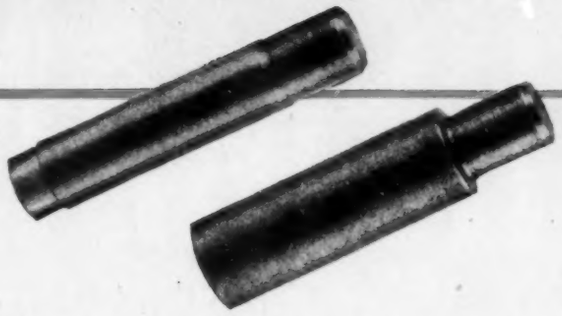
1 • SHORT RUN TURNING



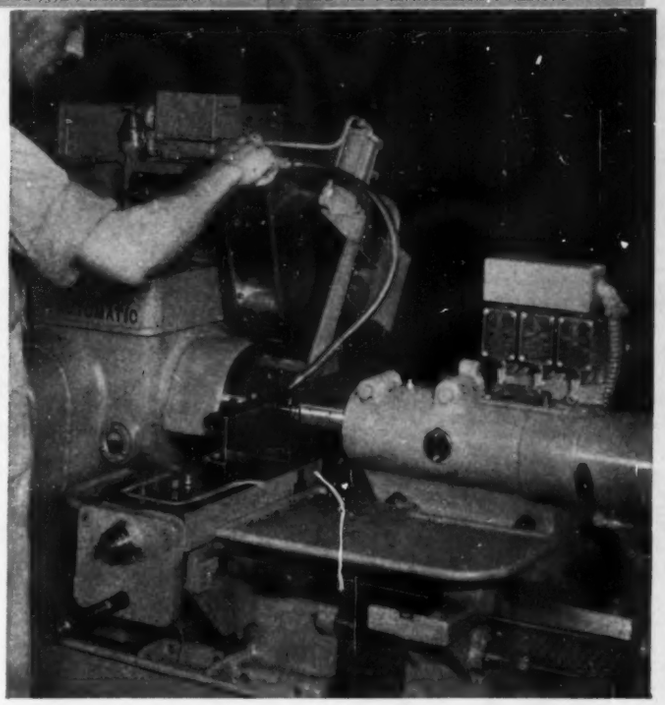
Over 40 different sizes of Rotor Assemblies, in lot sizes ranging from 20 to 200 pieces are turned on this Model 12 Automatic Lathe. Operations include turning, facing and counterboring the copper and steel laminations. The facing and counterboring of both ends is performed in one operation simultaneously with the turning operation. One set of tool blocks handles all rotor sizes up to 12½" diameter. The machine is a standard model provided with a special overhead attachment and special tooling.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

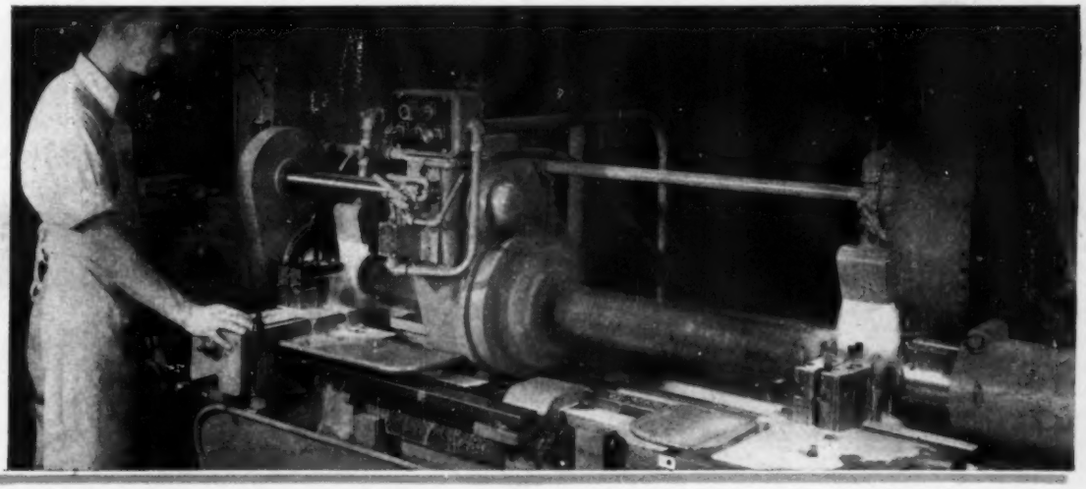
RIGIDMILLS • FLUID SCREW RIGIDMILLS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT



2 • LONG RUN TURNING



Here's an excellent example of high production turning and automatic handling of small parts. Two hundred cast iron valve guide bushings are turned per hour on this standard Model 8 Automatic Lathe with special hopper loading device. The operator's only duties are to keep the hopper filled. The bushings have two diameters turned, are automatically loaded between centers, automatically turned and automatically ejected.



3 • SPECIAL TURNING

Here's a standard Model 10 lathe with a special bed for handling work up to 66" long between centers. Two longitudinal feeding front carriages and two cross feeding rear tool slides are used with a center drive unit so that both ends of the part can be machined simultaneously. Both front and rear slides are adjustable so that, with some additional tooling, approximately 12 different sizes of parts can be accommodated. Production with this lathe and tooling has been increased on an average of five times over the former method. Operations consist of turn, shoulder and chamfer both ends of brake beams.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

SUNDSTRAND

MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

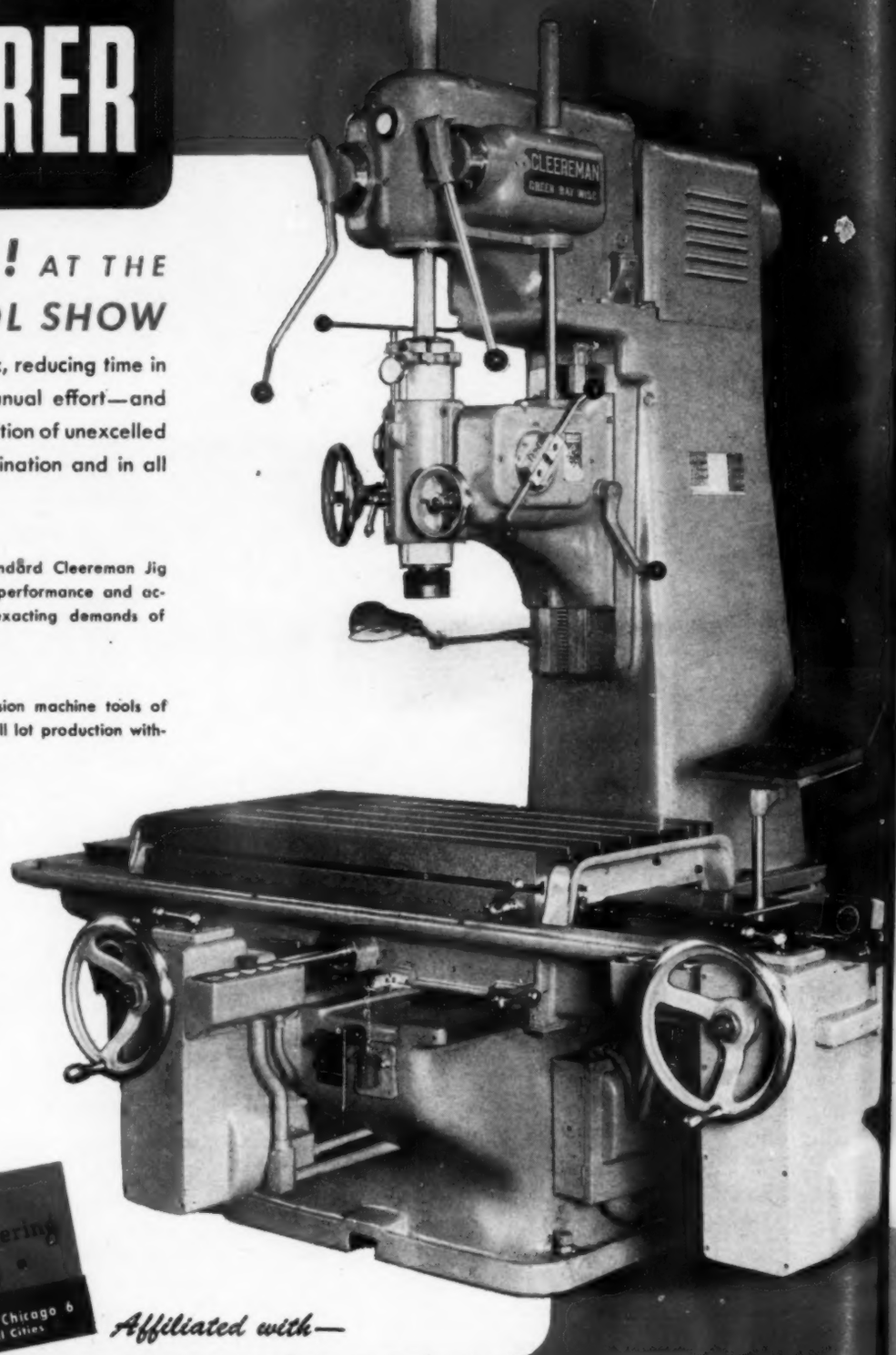
DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

CLEEREMAN

UNEXCELLED PRECISION

Electronic controlled

JIG BORER



Acclaimed! AT THE MACHINE TOOL SHOW

for increasing the scope of work, reducing time in operation, eliminating much manual effort—and maintaining the Cleereman tradition of unexcelled precision in construction, co-ordination and in all finished work.

A notable companion to the standard Cleereman Jig Borer which has made enviable performance and accuracy records in meeting the exacting demands of industry both here and abroad.

Both models are extremely precision machine tools of great versatility which handle small lot production without the usual costs of layout time and jig or fixture manufacture and are equally capable of producing tools, dies and jigs or fixtures with unexcelled precision.

With electronic controlled motors, the Cleereman Jig Borer has power drive to table to provide prepositioning control, and in addition, it locates and mills surfaces within "tenth" limits with a full range of milling feeds.

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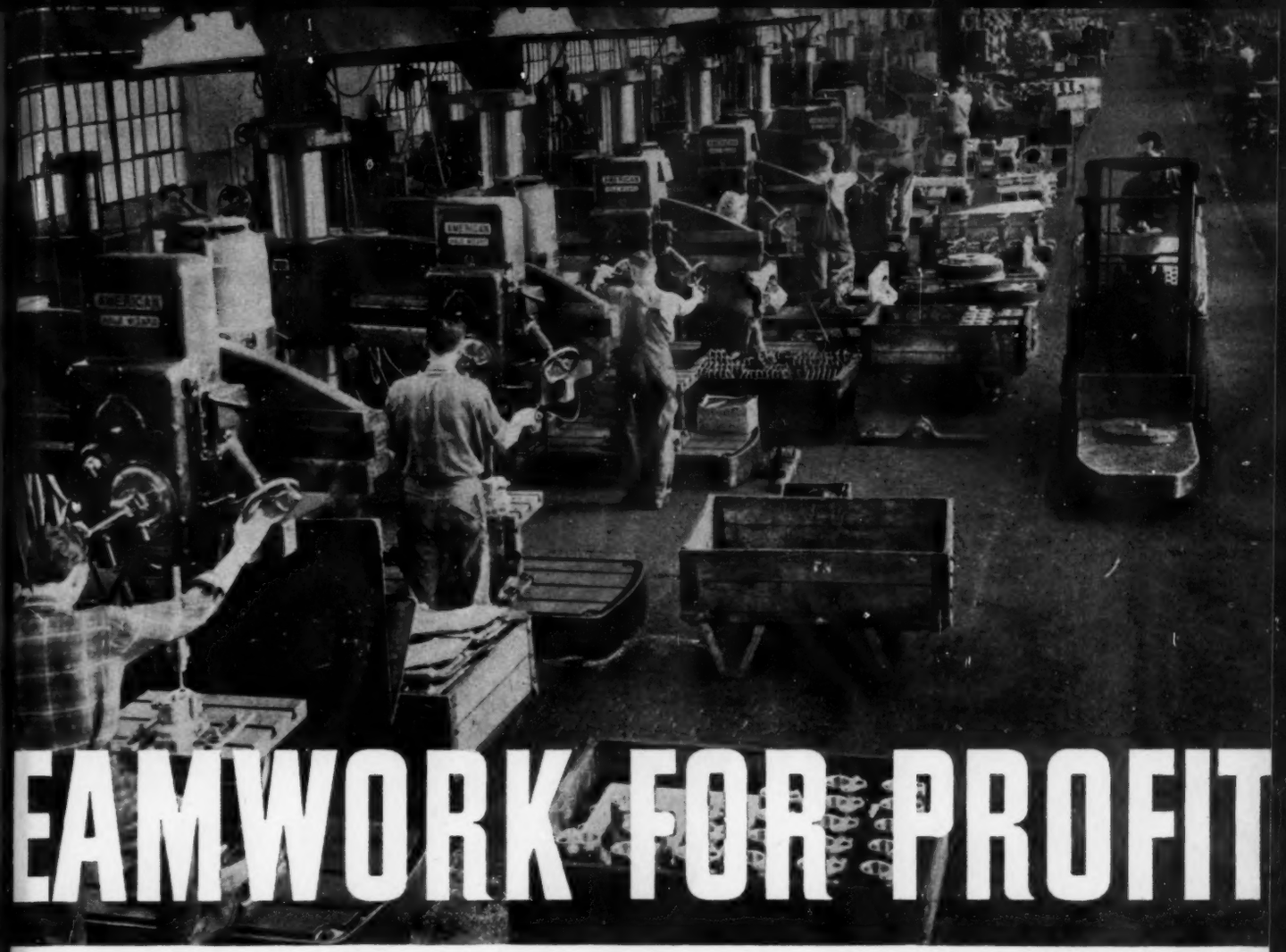


EAMWORK FOR PROFIT

Courtesy of Fairbanks, Morse & Co.

uality Tools produce a Quality Product

Fairbanks, Morse & Co., one of the world's leading manufacturers of Electrical Equipment and Diesel Engines, uses scores of "American" Hole Wizard Radial Drills to produce quality at a profit.

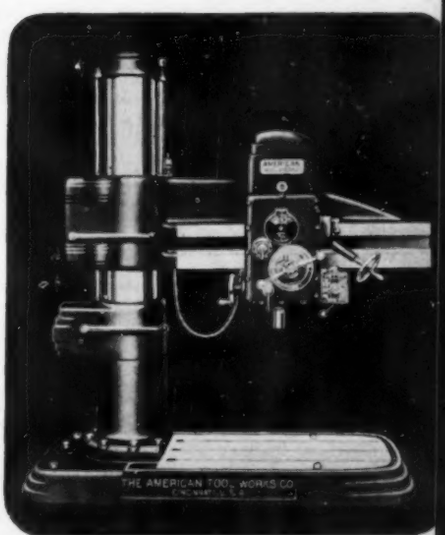
The smooth operation and easy handling of "American" Radials give them front rank recognition amongst users as dependable producers of accurate and finely finished work.

The directly connected, head mounted motor guarantees maximum power at the spindle.

Finger-tip and direct-reading controls insure speedy manipulation for greater work production.

Anti-friction mounting of head on arm and convenient location of all operating levers mean less operator fatigue and more work at day's end.

For quality work at a profit your best bet is "AMERICAN".



THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

When your drill
(FOR MANGANESE
a Morse

Here's a case history showing what happens when a Morse Cobalt Drill goes to work on a tough, manganese steel switch point. (Brinell test 228 —11% to 12% Manganese, actual analysis—thickness 2½".) A point pressure of 10,000 lbs. was needed at 50 R.P.M. and .0075" feed. The 1" Circle C Cobalt Steel Drill, with Taper Shank, drilled up to 10 holes per grind. It succeeded where 2 Tungsten High Speed Steel Drills failed to penetrate (as shown circled in illustration.)

must have a "Sunday Punch"

AND HARD STEELS, CASTINGS, FORGINGS)

Cobalt *Packs Plenty*

That Morse Cobalt — "that's for me" you'll say, once you see this drill operate! It can be run 25% faster and maintain its sharp cutting edges — even when drilling 10–12% manganese steel, castings, forgings and other drill killers. It performs where standard high speed drills fail — will drill steels with a Brinnell up to 450.

Morse Cobalt Drills are specially designed for the brutal jobs — with short twist cut, heavy web, oversized shank and 150° point angle. They are made to operate under extremely high pressures. Modifications of this design of Cobalt Drills are available for less severe operations.

The *full* line of standard and special Morse Drills of the precise length, diameter and twist cut includes drills that will do any job for *you — and do it well longer!* Your Industrial Supply Distributor and Morse engineers can team up to *your* profit in recommending the right cutting tools for your requirements.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manu

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

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From Production Line to Tool Room

... the "Stuff" to do the job!

ONE WEEK DELIVERY

The popularity of this Norton Surface Grinder enables us to build it on a production basis. Machines with standard mechanical and electrical equipment can be shipped in one week from receipt of order.

The NORTON 6 x 18" Surface Grinder *provides:*

1. Accuracy to meet exacting tool room requirements
2. Speed to meet the needs of the production line
3. Ease of operation and control
4. Sturdiness and durability for low maintenance cost
5. Dependability of NORTON design

These are some of the features that have made the Norton 6" Hydraulic Surface Grinder so outstandingly popular. It is completely illustrated and described in Catalog 954. Write for a copy today — no obligation.

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NORTON GRINDERS
and Lappers

Shoot for lower grinding costs

You can deal your excess grinding costs a fatal blow!

Call in Peninsular engineers . . . they are experienced trouble-shooters in grinding operations. Perhaps they can kill a profit leak for you—where you didn't know a saving was possible. They've done it for others!

Peninsular engineers examine everything about your grinding operations—the machinery used, materials ground, the finishes required. After a thorough analysis of these factors, Peninsular develops and recommends wheels specifically designed to fill your needs.

Peninsular has been successfully shooting for lower production expenses in almost every industry for 58 years.

Let them hunt down any excess in your grinding expense—no cost to you.

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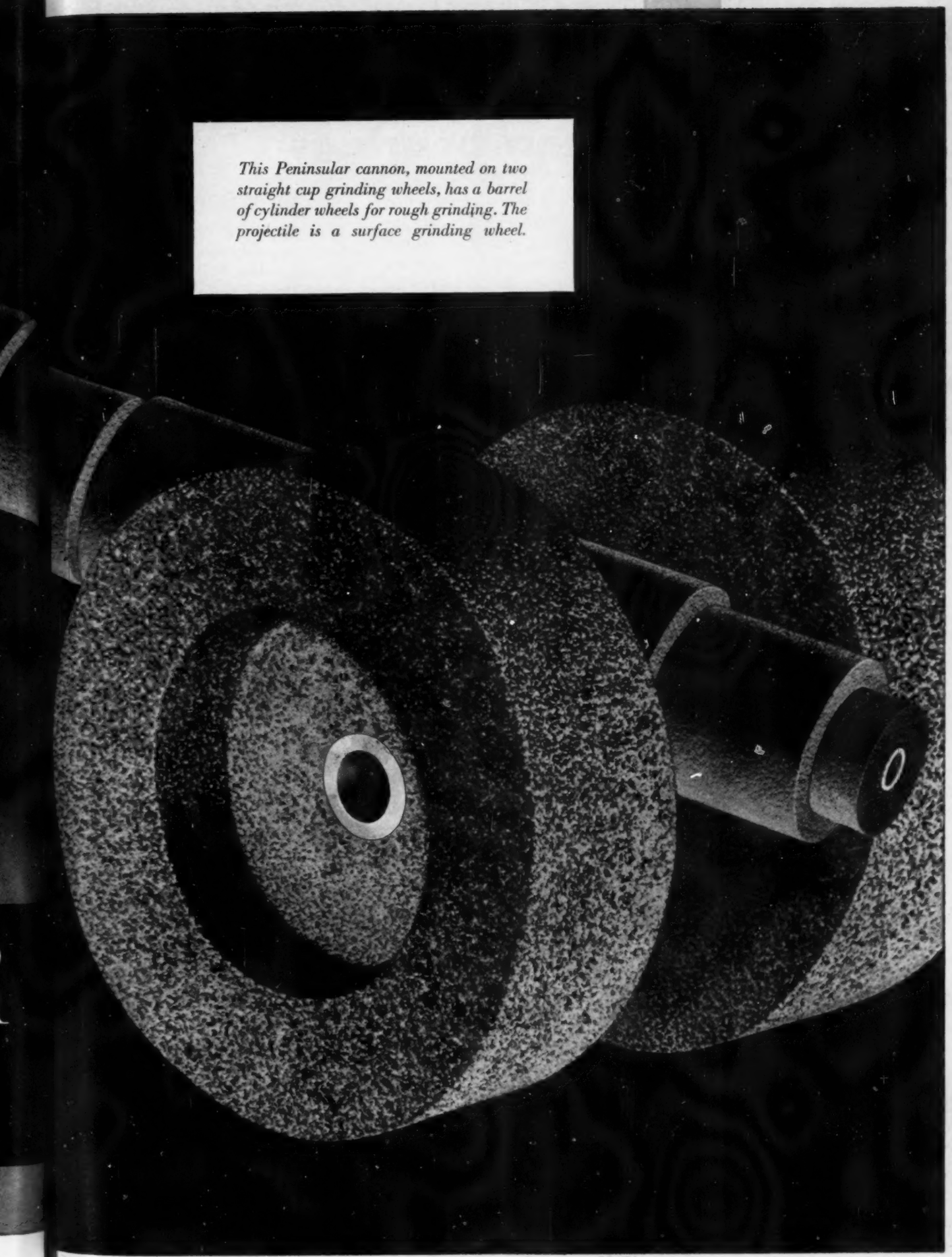
INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS



This Peninsular cannon, mounted on two straight cup grinding wheels, has a barrel of cylinder wheels for rough grinding. The projectile is a surface grinding wheel.

Feeds, straightens and cuts steel rod at a speed of 125 ft. per minute on Timken® bearings

IN the Model No. 20-F Lewis Travel-Cut Shape Straightening and Cutting Machine, manufactured by The Lewis Machine Company of Cleveland, Ohio, a total of 70 Timken bearings are used on such vital parts as the feed and straightener rolls, the transmission drive, and the flywheel and cut-off mechanism drive.

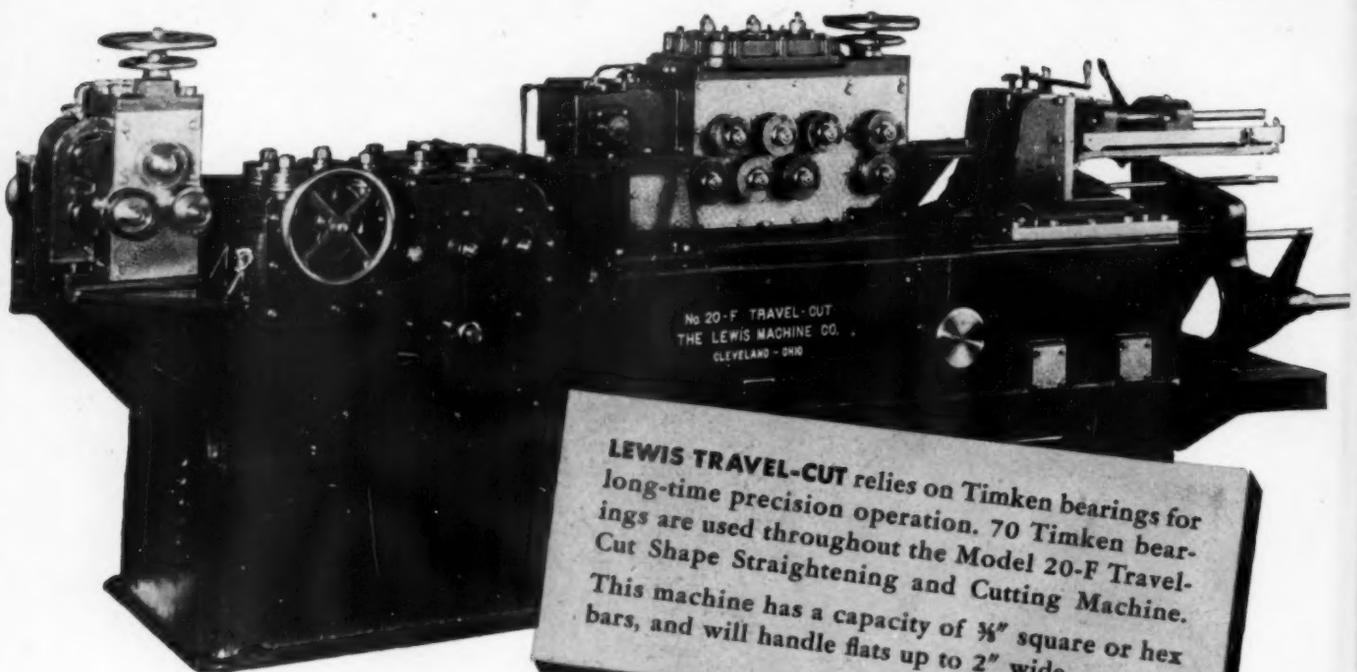
Result: precise, trouble-free operation at a rate of 125 feet per minute, simplified lubrication, and efficient power transmission.

Due to the tapered construction of Timken bearings, they carry any combination of radial and thrust loads. Manufactured to extreme precision and finished to incredible smoothness, Timken roller bearings make friction practically negligible. Maximum load capacity is provided by the line contact between rolls and races. Timken bearings permit closures which retain lubricant. And since they're made of the finest bearing material ever developed—Timken fine alloy steel—they last the life of the machine.

Backed by 49 years of bearing research and development, Timken tapered roller bearings are first choice throughout all industry. No other bearing can bring you *all* the advantages you get with Timken bearings. Look for the trade-mark "Timken" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.



LEWIS TRAVEL-CUT relies on Timken bearings for long-time precision operation. 70 Timken bearings are used throughout the Model 20-F Travel-Cut Shape Straightening and Cutting Machine. This machine has a capacity of ⅜" square or hex bars, and will handle flats up to 2" wide.

WE MAKE OUR OWN STEEL

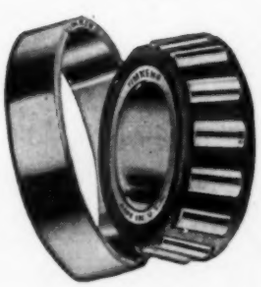
The special grade alloy steel which gives Timken bearings their strength and resistance to wear, is made in our own steel mills.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

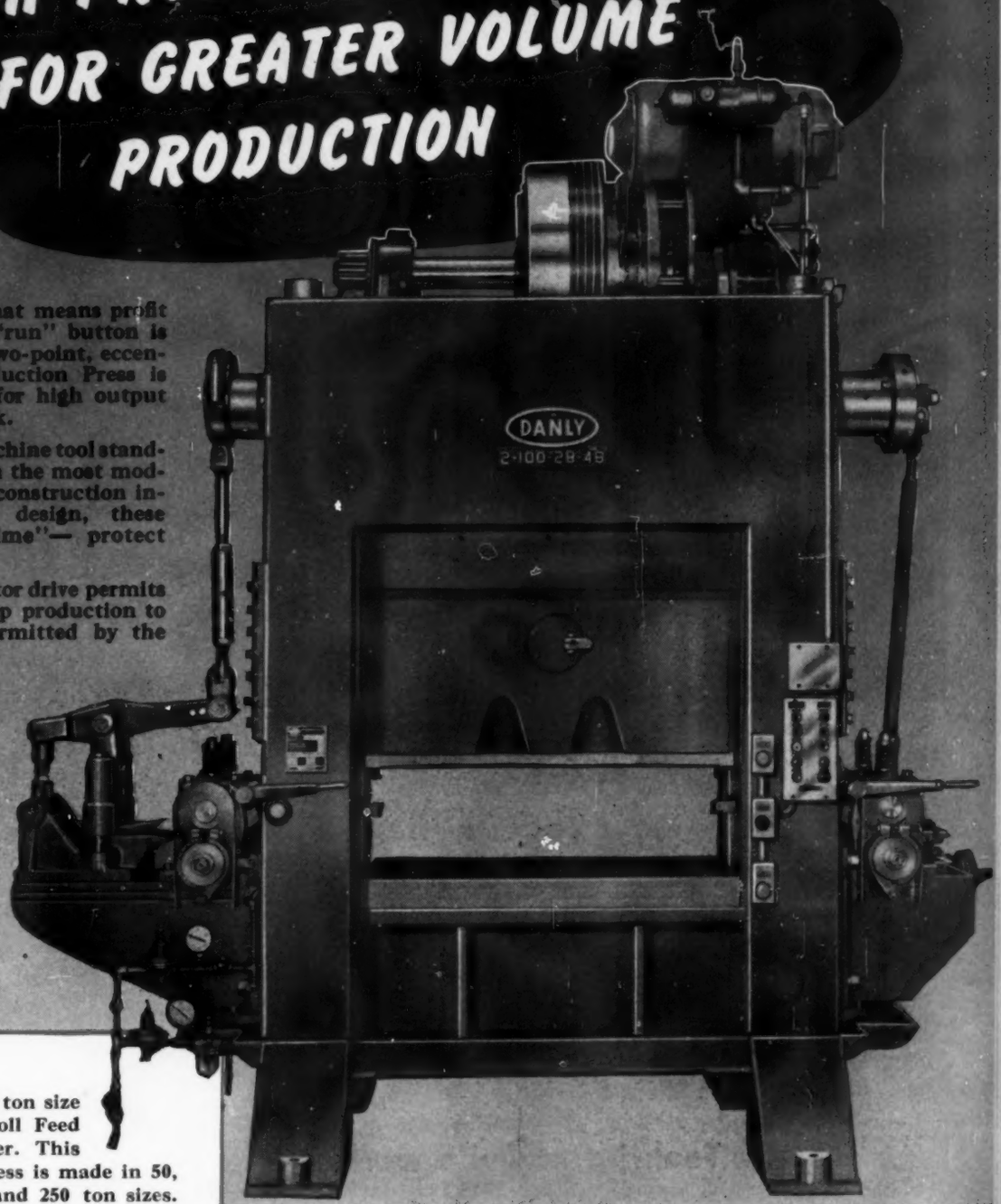
TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◯ AND THRUST ◯ LOADS OR ANY COMBINATION ✳

HIGH PRODUCTION PRESSES FOR GREATER VOLUME PRODUCTION



HERE is a press that means profit every time the "run" button is pushed. This Danly two-point, eccentric gear, High Production Press is specifically designed for high output of strip up to ¼" thick.

Sturdily built to machine tool standards of precision, with the most modern features of press construction incorporated in their design, these presses cut "downtime"— protect costly dies.

A variable speed motor drive permits the operator to step up production to the highest speed permitted by the material being stamped.

Compare the features and construction of this line of presses against those of their type with which you are now familiar. Danly's Press Division will be glad to supply more complete information upon request.

Shown is the 100 ton size equipped with Roll Feed and Scrap Cutter. This type of Danly Press is made in 50, 75, 100, 150, 200 and 250 ton sizes. Send inquiries for your requirements to Danly.

Check and Compare These Features

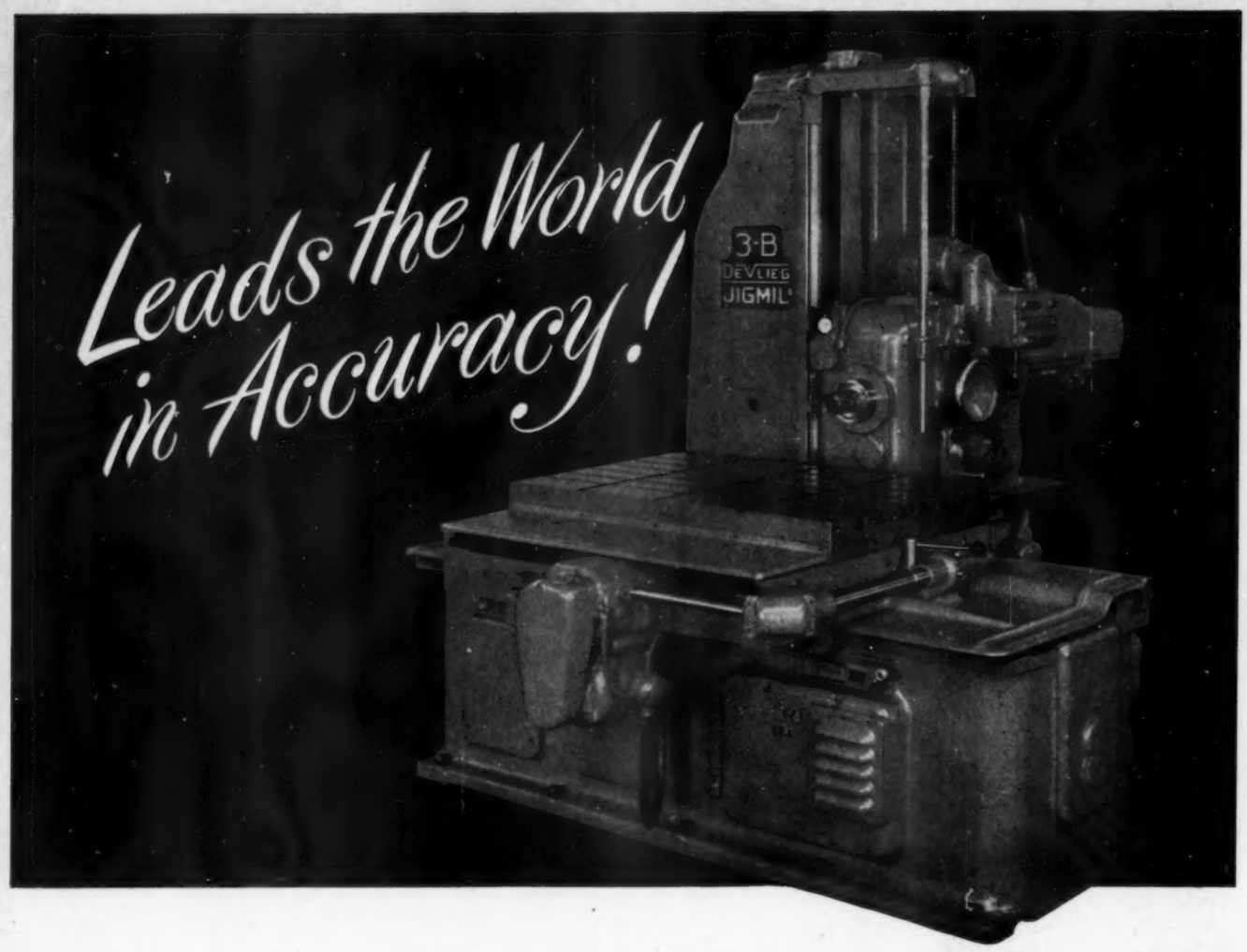
- Two slide connections for accurate alignment.
- Fully enclosed construction (all weldments thoroughly stress relieved before machining).
- Circulating filtered oil pressure lubrication system. Pressure pump so arranged that press is inoperable until oil pressure builds to operating pressure.
- Variable speed motor drive (50-100 strokes per minute).
- Danly Improved Air-Friction Clutch.
- Flywheel shaft mounted on anti-friction bearings retained in removable pillow blocks provides easy accessibility for maintenance.
- Eccentric Gears, connections and gibs—bronze lined.

DANLY

MACHINE SPECIALTIES, INC.

2100 S. 52nd Avenue, Chicago 50, Ill.

THE PRESS FOR MODERN PRODUCTION



The DeVlieg JIGMIL is now recognized as The World's Leader in the field of accurate boring, in addition to its unique capacity for high productivity on:

1. **Single part precision boring.**
2. **Tool, jig and die work.**
3. **Repetitive production work without jigs.**

Write today for new descriptive booklet.

DEVLIEG JIGMIL

DeVLIEG MACHINE COMPANY

450 FAIR AVE., FERNDALE 20, (DETROIT) MICH.

The ADAMS Line

Spur Gears
Helical Gears
Bevel and Miter Gears
Worms and Worm Gears
Internal Gears
(spur and helical)
Sprockets
Ratchets
Splined Shafts
Racks
Lead and Feed Screws
Ground Tooth Gears
(spur and helical)
Shaved Tooth Gears
(spur and helical)
Ground Thread Worms

Quality control at ADAMS *pays you dividends!*

In every stage of their manufacture, Adams precision-made gears are subjected to rigid inspections for quality control and to assure exact conformance with your specifications. The inspections go on continuously in the shop and in the modern Adams gear checking department. This careful attention to detail right down the line pays you dividends in two ways—it means fewer rejects and it means better performance for your product. When you need gears, call on Adams for high quality gears made *exactly* to your specifications. THE ADAMS COMPANY 1942 Bridge Street, Dubuque, Iowa.

The ADAMS Company
Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . ESTABLISHED 1882

Easy to Read...

Easy to Write!

...nothing to convert or translate in these Direct VEEDER-READINGS

What you *see* is what you *get!*

Those figures in the counter-window give you (or your inspectors) a plain statement of production as it stands right now—in terms of strokes, turns, pieces or other units completed.

And those same figures, in other ways, can help your machine-operators, too—by enabling them, for instance, to pre-set depth of cut on a machine *in numerical thousandths,* instead of fussing around with dial-graduations. This saves important money in time and errors.

That's one reason why more and more designers are figuring out jobs for Veeder-Root Devices, *and then building them right into their machines.*

And no matter how *you* figure, you can count on Veeder-Root Devices for this:

Read 'em and reap! Yes, reap more benefits than you can even begin to imagine now. *Like to learn more?* Write.

VEEDER-ROOT
INCORPORATED
HARTFORD 2, CONNECTICUT

In Canada: Veeder-Root of Canada, Ltd., 955 St. James St., Montreal 3.

In England: Veeder-Root Ltd., Dickinson Works, 20 Purley Way, Croydon, Surrey.

Avey's PLUS features

add up to TOP PRODUCTION

Vee belt used on final drive from gear box to spindle. Increases speed and sensitivity in drilling. Carries full horsepower from motor to job.

"VEE" BELT DRIVE

AVEY TYPE BMA-6

Four Spindle—12" Overhang

1st spindle—Avey-matic feed
2nd spindle—Plain power feed
3rd spindle—Hand Feed
4th spindle—Tapping (reversing motor)

plus STANDARD MOTOR — EACH SPINDLE

Each spindle of AVEY BMA-6 individually motor-driven by standard frame constant speed motor. Foot-mounted motor easily interchanged or replaced. Standard motors can be stocked.

plus SIX SPEED CHANGES

On the AVEY BMA-6 six speed changes are made through selective, sliding gears. This automotive type of gear shift is controlled by a single lever at front of machine. Provides versatility and effective operation.

plus SPEEDS OBTAINED — SLIDING GEARS

Selective, sliding gears of AVEY BMA-6 change speeds quickly and easily. Each gear is manufactured and finished by accurate, modern process, shaved, hardened and lapped. Insures smooth operation and long performance.

CAPACITY Cast-Iron

No. 2BMA6—7/8" No. 3BMA6—1 1/4"

Single to six spindle machines, equipped with hand feed, power feed or reversing motor tapping.

CLIP AND MAIL TODAY

AVEY DRILLING MACHINE CO.,
CINCINNATI 1, OHIO

Gentlemen: Please send without obligation your new Bulletin 647.

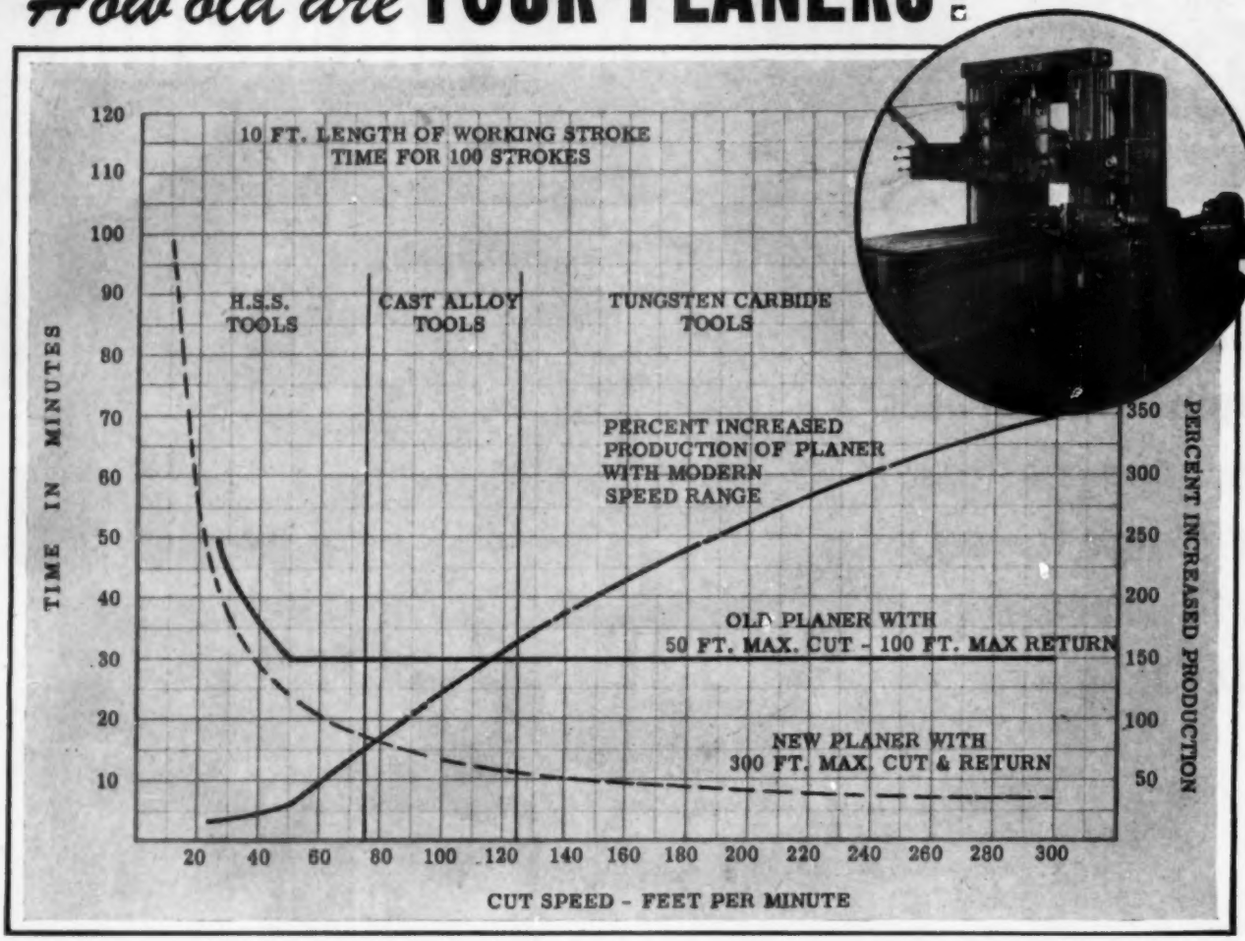
COMPANY_____

ADDRESS_____

NAME_____

Avey DRILLING MACHINES
CINCINNATI, OHIO

How old are YOUR PLANERS?



A leading machine tool builder reports 75% increased production on his 1947 Grays as compared to his 1926 Planers, because he is now running at speeds made practical by

*** GRAY NON-METALLIC TABLE WAYS**

*** GRAY LOOP LUBRICATION**

HOW FAST ARE YOUR PLANERS RUNNING?

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

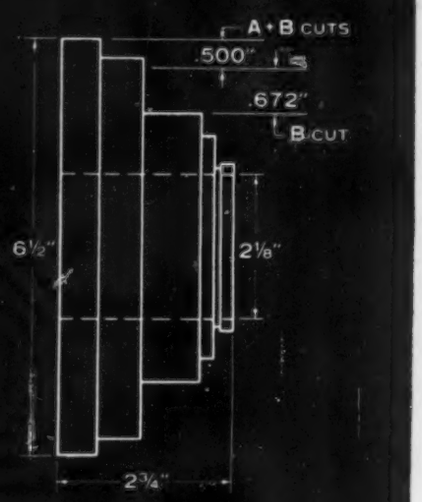
YOU CAN CUT YOUR TURNING COSTS

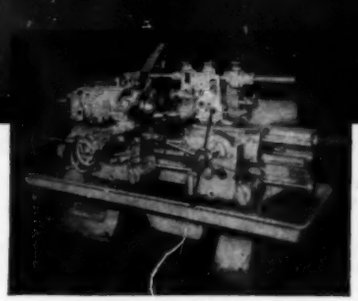
if

your lathes have the Power, Rigidity and Spindle Speeds to use Carbide Tools effectively

for instance . . .

Note the power and speed required to turn the two principal diameters of this SAE-1020 steel part, machined with carbide tools on a Jones & Lamson No. 5 Ram Type Turret Lathe. Two cuts taken simultaneously on the A and B diameters at 305 SFM WITH .015" FEED, require 15 HORSEPOWER. The second cut on the B diameter at 257 SFM and .015" FEED, requires 18 HORSEPOWER. This piece is machined from cut off stock to the dimensions shown, in 7 MINUTES, floor to floor—twice as fast as with high speed steel cutting tools.





Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

YOU CANNOT COMPETE with production like this with machines less powerful, less rigid.
Jones & Lamson Turret Lathes guarantee your investment.
They anticipate the future in metal turning.
They are built with great reserves of ruggedness.
They are powered to meet even more than today's requirements for the effective use of carbide tools.
Let a Jones & Lamson engineer study your turning operations. He will be able to make recommendations that will improve your profit picture. He has for others.

JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.

Jones & Lamson Lathes

ARE POWERED FOR CARBIDE

THE NEW Van Keuren

0 to 3" LIGHT WAVE MICROMETER

will improve your product . . .

Hardened, Ground, and Lapped ½" diameter Micrometer Screw. Reads to .00001" Carboloy tipped spindle and anvil.

The
LIGHT WAVE MICROMETER HEAD

A source of dependable Precision for modern machine tool and instrument applications.

●

Price, with calibration chart **$75.00**

THE Van Keuren Light Wave Micrometer is an instrument of exceptional merit, proven over a period of 15 years. It has enabled hundreds of High School boys and girls to produce and inspect parts to "Hundred Thousandths" of an inch.

The New 0 to 3" Light Wave Micrometer has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non parallax, vernier index which enables readings to be made to .00001". It has an index lock. It has carboloy tipped anvil and spindle. It is a sturdy, yet sensitive instrument which weighs 17 pounds. It is a portable measuring machine, built for "Sustained Accuracy".

The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision—fast, accurate and profitable.

The 208 page Van Keuren Catalog and Handbook No. 34 includes new epoch making formulas and 10 new tables which reduce the computations for the exact measurement of screws to a process of simple division. Your copy will be mailed promptly upon request.

●

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

29th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

14 OPERATIONS—A SINGLE SETUP Machining time is 23 seconds on this chuck hood, turned from X1112 bar stock. Size: 1⅜" dia. x 2¾" long. Machine: Acme-Gridley 1⅝" RB-8 Bar Automatic.

SAVED!

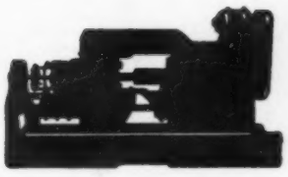
. . . Second Operations

You can save money, time and space with Acme-Gridley multiple spindle automatics.

This statement is based on our experience in building and installing more than 40,000 such machines since we pioneered the first multiple spindle automatic, back in 1893.

By the use of more universal and independently-operated attachments you often can combine first and second operations. That way you save on handling time, on cost of machines, on floor space—and on labor.

And with easy, quick change-overs, made possible through the use of quick-changing positive cams, you'll get more *good* pieces in the pan, on both short and long runs. Challenge us to prove it.

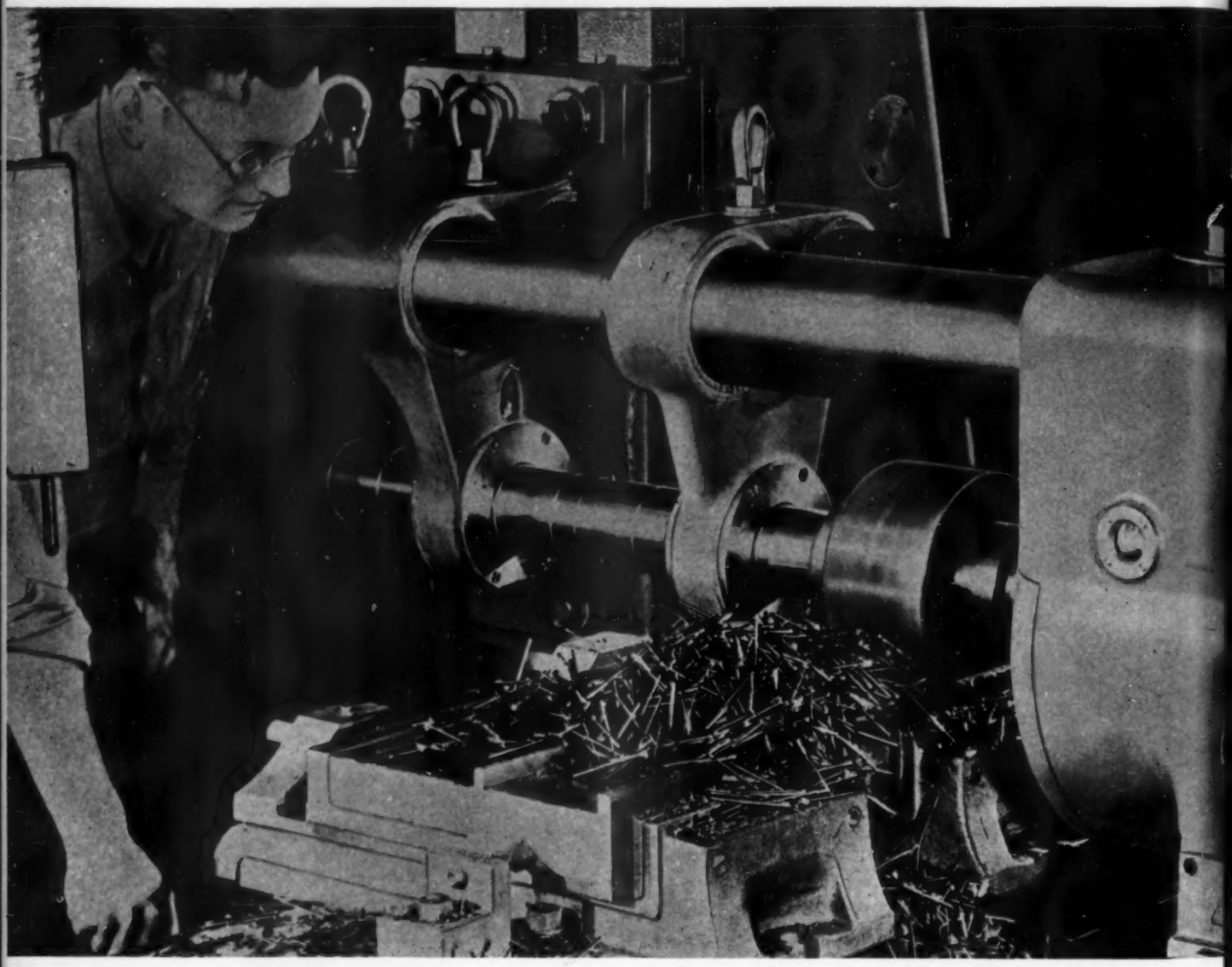


ACME-GRIDLEY BAR and CHUCKING AUTOMATICS maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

PUTS BIG BITE ON



NEW SIMPLEX BED-TYPE MILLING MACHINE — Kearney & Trecker's new concept of bed-type design. Gives you wide working ranges and horse-power capacities for most effective use of all cutting tools.

MODEL 3K VERTICAL AUTOMATIC CYCLE MILLING MACHINE — New Automatic Cycle feature gives you high production capacity on long run lots — and amazing new ease of control for short runs.

MODEL 2H PLAIN MILLING MACHINE — The most popular size machine ever built. Available in Plain, Universal and Vertical types. Automatic Cycle feature obtainable on either Plain or Vertical types.

METAL & COSTS!

High power, cost-cutting Kearney & Trecker-Milwaukee Milling Machines help Industry produce more for less.

SEE that job at the left? See that pile of chips? That's a big new design of Simplex Bed Type Milling Machine knifing a carbide cutter through hard steel at a record rate.

But that's only a small hint of what Kearney & Trecker machines can do for you. There's a Kearney & Trecker machine for every milling job — in small shops, high production plants or precision tool rooms. There's a Kearney & Trecker in every standard size and type with horsepowers from 3 to 50 with working ranges to suit. Think of it! Over 250 different models, sizes and types to choose from — to select the right machine for your job!

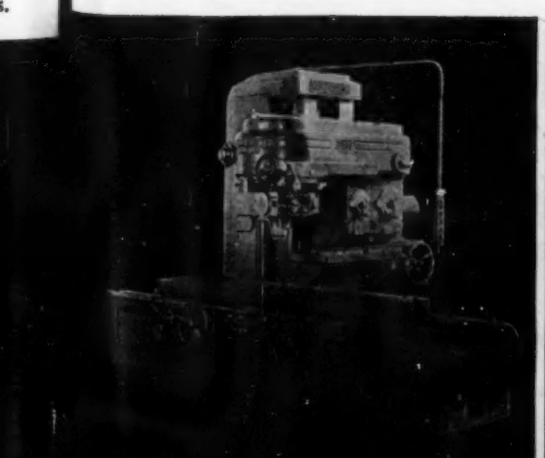
And don't overlook Kearney & Trecker's Model 2D and new 5D Rotary Head Milling Machines — miracle machines that produce any geometric shape in both horizontal and vertical planes direct from the blueprint — no models or templets needed! For precision boring — there's the Models B and C Autometrics. Machines that give you accuracy to the closest standards ever set at Kearney & Trecker.

Investigate Kearney & Trecker-Milwaukee Machine Tools! Ask how they can help you make a better product at lower costs to you.

KEARNEY & TRECKER
CORPORATION
Milwaukee 14, Wisconsin

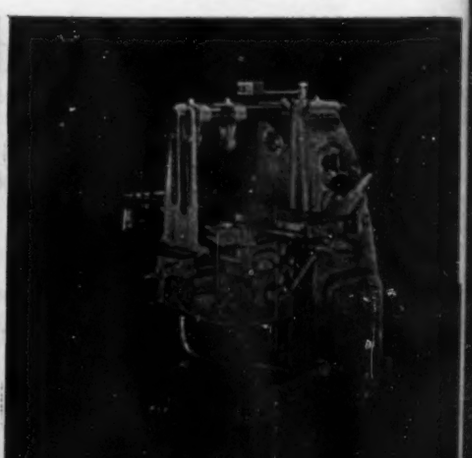
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

MODEL 5D ROTARY HEAD MILLING MACHINE — A miracle of big machine design. Produces any geometric shape in horizontal or vertical planes direct from blueprint — no models or templets!

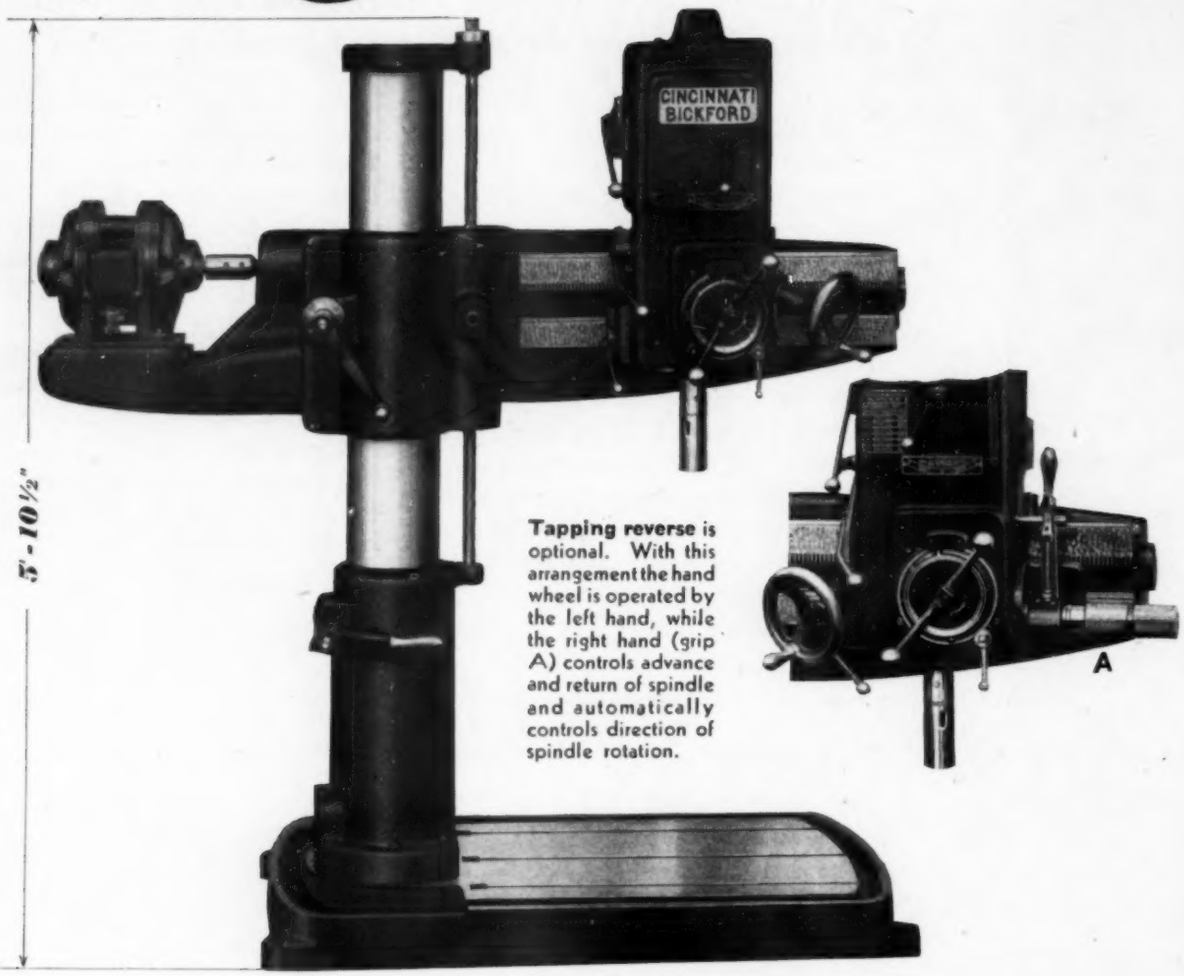


MODEL B AUTOMETRIC BORING MACHINE — A precision product for extra-precise results. Rotary table permits work on several sides of workpiece in one set-up — big help in accuracy and economy.

MODEL E PLAIN MILLING MACHINE — New simplified design gives you every fundamental requirement for foreign or domestic use — plus highest dollar for dollar value obtainable anywhere.



SMALL MACHINE... *big Production-*



Tapping reverse is optional. With this arrangement the hand wheel is operated by the left hand, while the right hand (grip A) controls advance and return of spindle and automatically controls direction of spindle rotation.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE
Radials 7½" dia. col., 2½' arm, to 96" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

Basic features that lower costs in the field of small, high-speed drilling and tapping are found in the 2½' arm simplified design Cincinnati Super Service Radial.

High speeds (to suit your job). Low investment (through simplified design and a completely jigged production setup).

Power saving (one horse power motor), saving in floor space, and speedy operator handling through convenient finger touch controls.

These small machines are accurate and sturdy, and are built to steadily produce at low costs.

Write for Bulletin R-26-A for details of the many new features found in these machines.

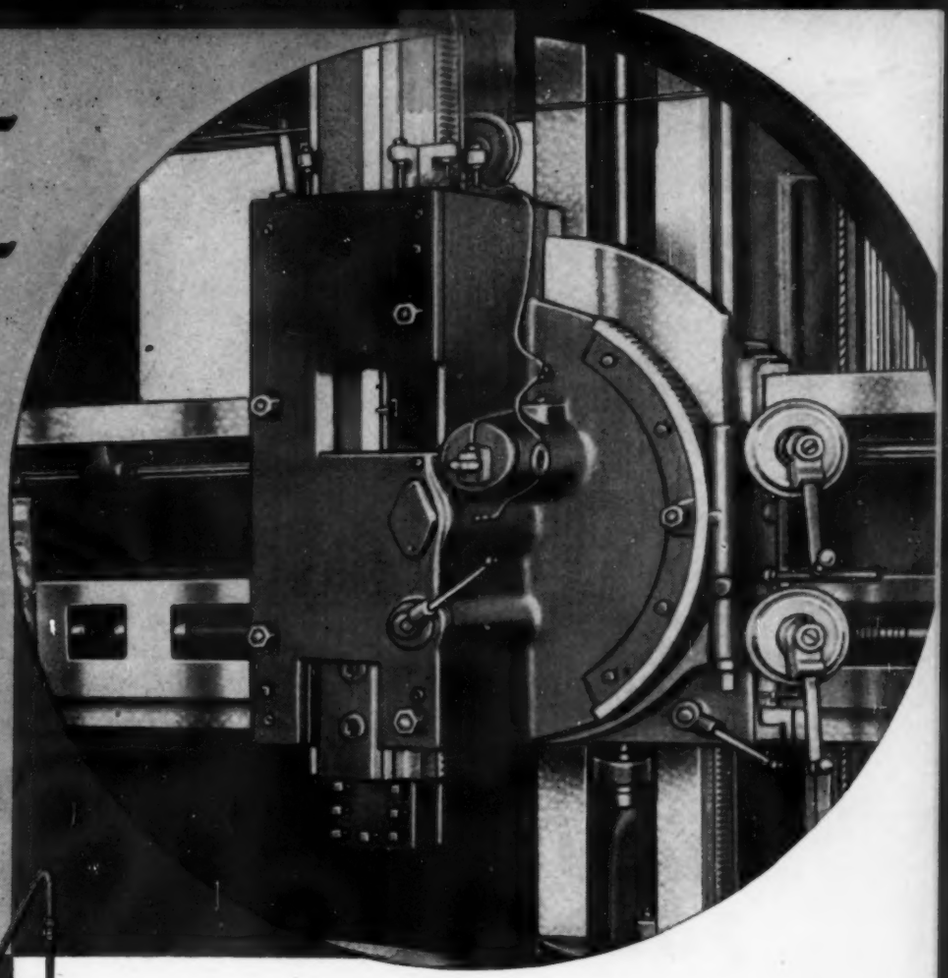
THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9. Ohio U.S.A.

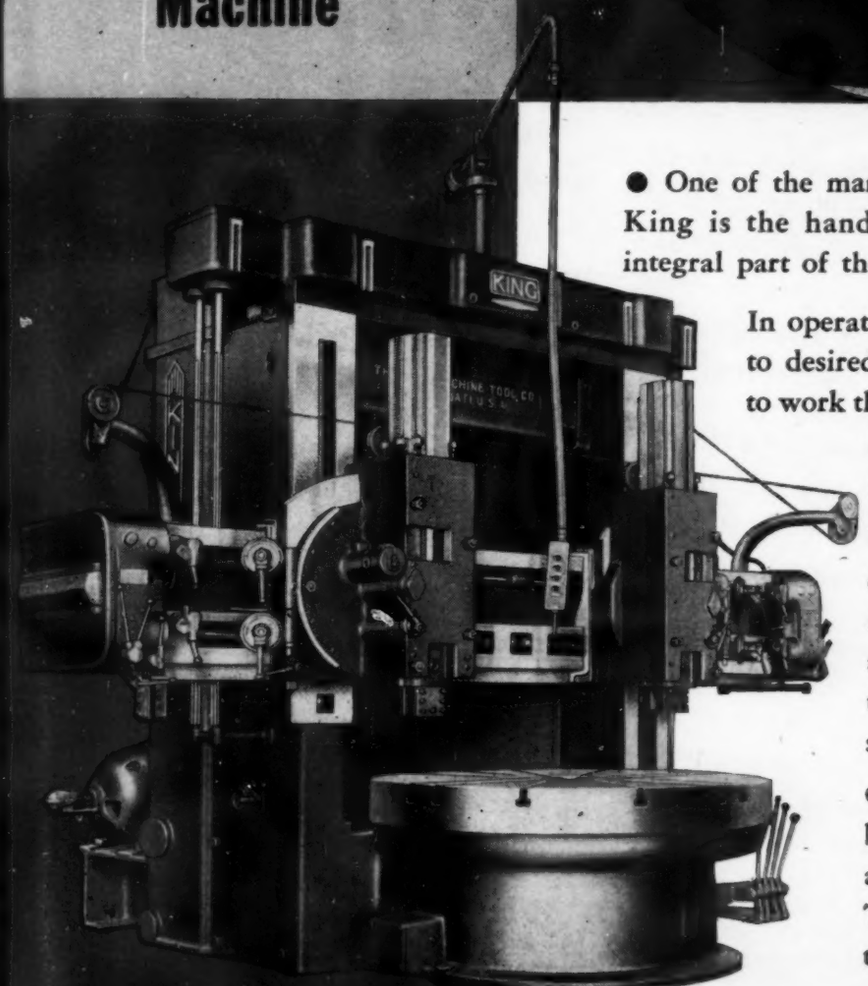
SKIM CUTS-
DEEP CUTS-

Adjustment is easily and quickly made on the

KING

Vertical Boring and Turning Machine





● One of the many conveniences of the New Series King is the hand adjustment levers which are an integral part of the head and travel with it.

In operation it is easy to rapid traverse head to desired position, traverse ram down close to work then with hand adjustment lever make final adjustment, accurately from normal working position.

Whether making a skim cut or deep cut in steel with carbide tool the massive head construction insures accuracy and its rigidity enables you to get exceptionally fine finish on skim cuts.

Consult a King Engineer on your boring—turning—and facing operations. King Vertical Boring and Turning Machines are available in ten sizes from 30" to 144".

THE KING MACHINE TOOL COMPANY

CINCINNATI 29, OHIO

Builders of Vertical Boring and Turning Machines and Sebastian Lathes

20 YEARS' EXPERIENCE MAKING BLANCHARD WHEELS FOR BLANCHARD GRINDERS

With this accumulated experience, why not allow us the opportunity to demonstrate the superiority of Blanchard Wheels. We'd like the opportunity to prove to you the superiority of Blanchard Wheels: that they are faster in removing metal —give a finer finish for the type of wheel—are cool and free-cutting—do not require "truing up," and very seldom require dressing. And, because we make and sell a lot of them, they are inexpensively priced and quickly delivered.

The constant use of our wheels on our own work, with every facility for testing their performance in our laboratory and *in the field* on Blanchard Grinders, gives our service engineers the expert knowledge which enables them to help you with any problem related to Blanchard grinding.

A card or letter will bring a Blanchard representative to your door.

This Booklet on Wheels contains helpful information on the selection of grinding wheels for all kinds of work. It's free, of course. Send for your copy today.

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Milling HIGH SPEED STEEL

HASN'T SHORTENED THE *LIFE* OF THESE CUTTERS

BARBER-COLMAN CONVEX CUTTERS MILL FLUTES IN HSS TAPS, 600-800 PIECES PER GANG-SHARPENING, WITH NO BREAKAGE

High Speed Steel is tough to mill, and hard on the life of any cutting tool. Consequently maximum tool life would not ordinarily be expected on this job. Yet these Barber-Colman Standard Convex cutters mill 6 flutes in each of a gang of five High Speed Steel Tap bodies, producing 600-800 bodies per gang sharpening. This is good tool life in any ferrous material.

B-C Cutter Engineers have established tooth designs, methods of heat treating and special cutting clearances which provide fine results on a variety of milling operations. These improvements, built into all Barber-Colman milling cutters, are giving maximum tool performance and less machine downtime. Production costs *can be cut* by using tools which last longer.

PERFORMANCE RECORD:

Operation — Climb Milling Flutes, .1875″ radius.
Material — HSS (18-4-1)
Cutters — B-C Convex Cutters 3-1/4″ x 3/8″ x 1″
Feed — 3.4″/Min. Speed — 100 SFM
Tool Life — 600-800 pieces per gang-sharpening

Write for complete information on Barber-Colman Milling Cutters. Ask for catalog MC12.

MODERN MACHINES WITH ORDINARY BARBER COLMAN CUTTING TOOLS ARE NOT FULLY EFFICIENT

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST. ROCKFORD, ILLINOIS U.S.A.

Lodge & Shipley
ACME
TURRET LATHES

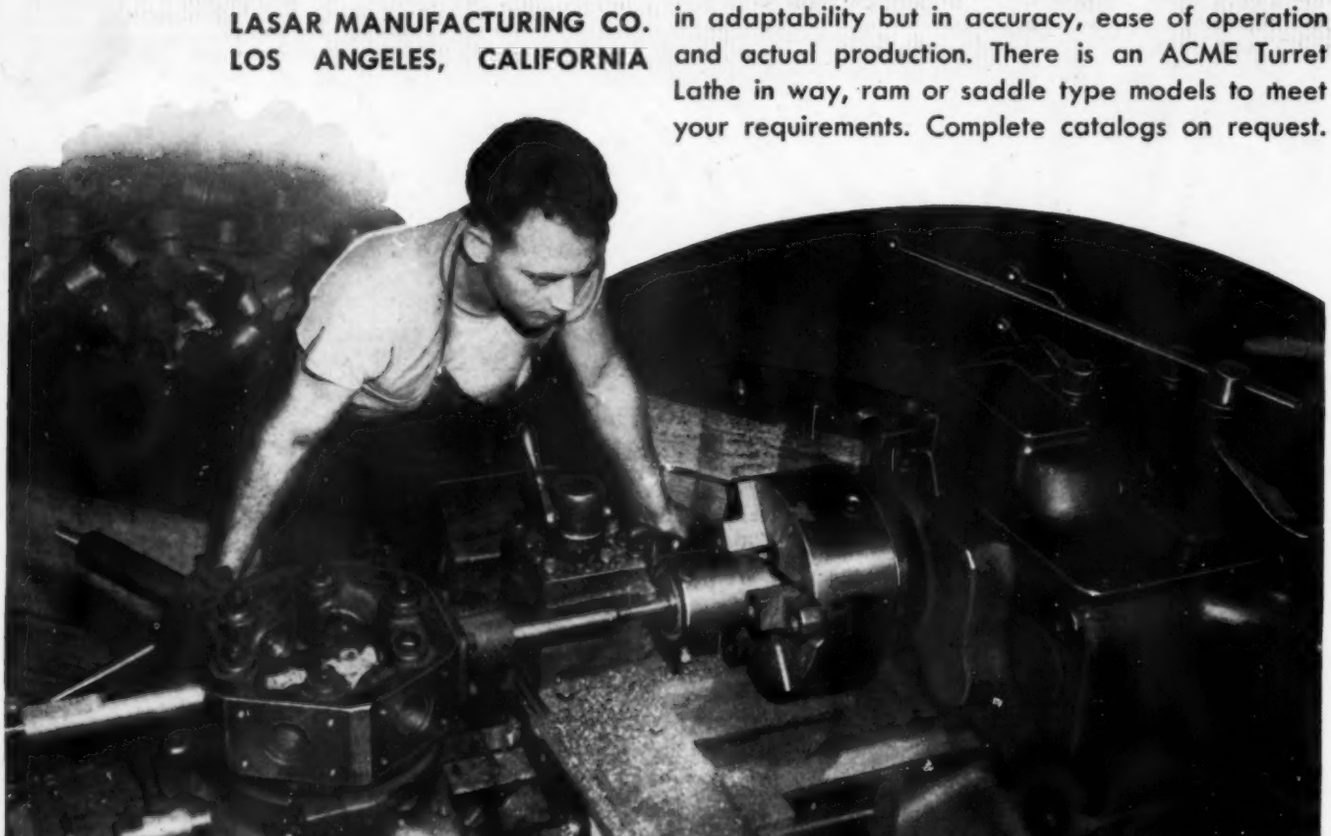
"IDEAL... VERY ADAPTABLE"

LASAR MANUFACTURING CO.
LOS ANGELES, CALIFORNIA

In speaking of adaptability, this well known firm says, "For the type of work we do, short set-ups, short runs . . . but precision work, holding size for bearing fits . . . these lathes are ideal. Size and finish stay constant and (they) are very adaptable for change-over."

Two batteries of Lodge & Shipley ACME Turret Lathes in the Lasar plant machine housings, gears, wheels and bearings for power Meat Cutting Machinery. Using carbide tipped tools, malleable iron and cast iron are turned, faced, bored and reamed. Illustration shows shaft housing being bored.

Lodge & Shipley ACME Turret Lathes excel not only in adaptability but in accuracy, ease of operation and actual production. There is an ACME Turret Lathe in way, ram or saddle type models to meet your requirements. Complete catalogs on request.



ENGINE
TOOL ROOM
MANUFACTURING
OIL COUNTRY
DUOMATIC (AUTOMATIC)
LATHES
TURRET LATHES

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

WHICH ALUMINUM CASTING IS BEST FOR YOU?

ASK ALCOA . . WE MAKE ALL THREE!

Ask us which type of Aluminum Casting is best for your product . . . and you get a frank, technically-sound answer. We make all three types, have no special bias in favor of any one of the three. Our job is to see that you use the casting that's best for your product . . . and for your production cost figures.

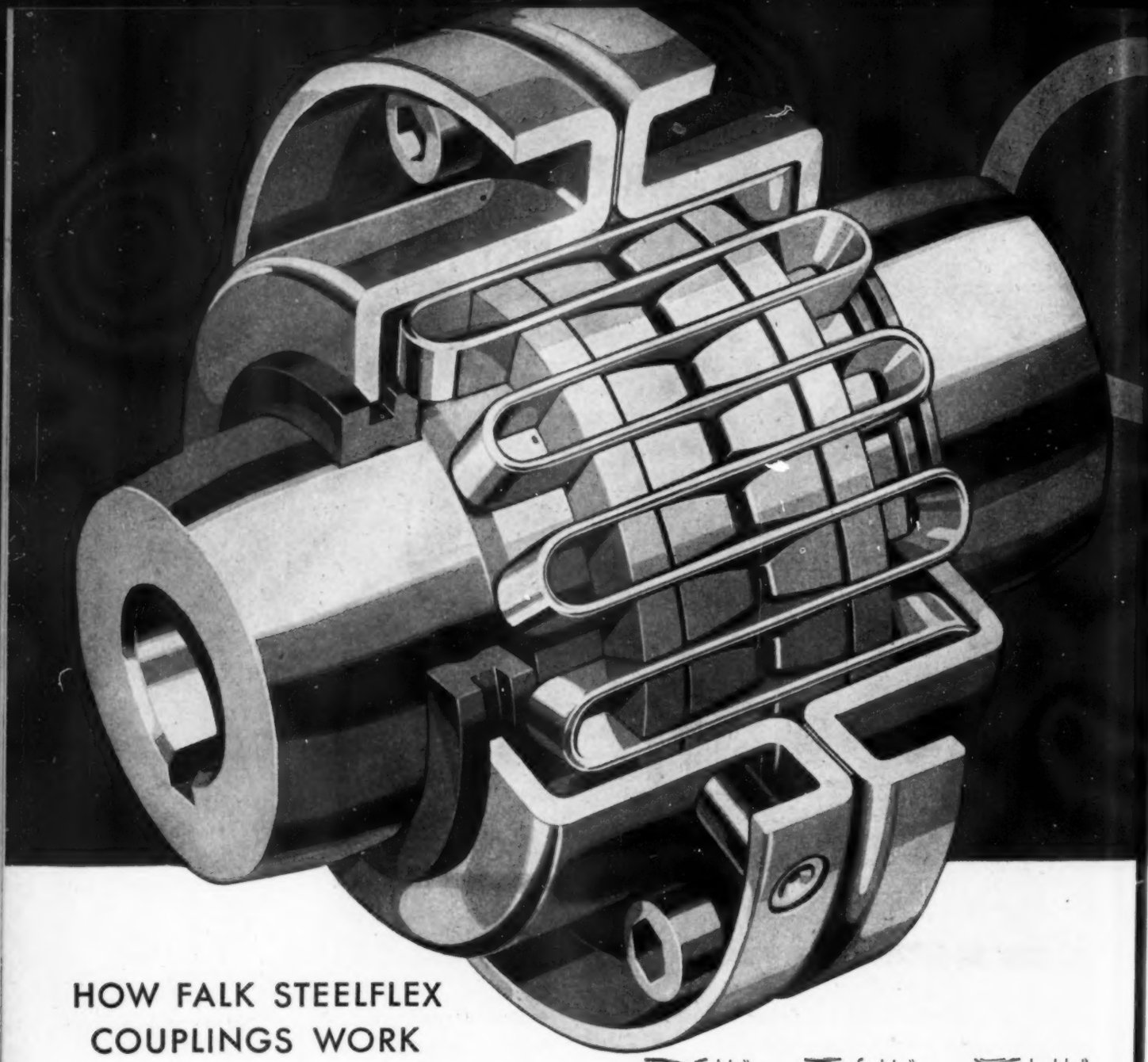
Each type of Alcoa Aluminum Casting —sand, permanent mold, and die—has its points. Your product may require a combination of two types, or even all three.

Our engineers and our 59 years of aluminum know-how are at your service to help you get the most from Alcoa Aluminum Castings. ALUMINUM COMPANY OF AMERICA, 1931 Gulf Bldg., Pittsburgh 19, Penna. Sales offices in leading cities.

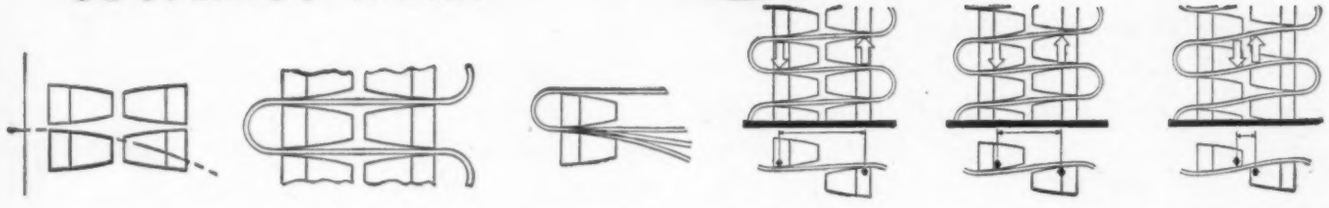
MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN ALUMINUM

IN EVERY COMMERCIAL FORM



HOW FALK STEELFLEX COUPLINGS WORK



1. Grooves, in a precise arc, and with a radius and length proportional to the capacity of the coupling, are cut into two identical hubs of moderately high carbon steel—forged of Falk alloy cast steel.

2. These grooves provide a slot for a grid member made of chrome alloy steel with an elastic limit of 180,000 pounds per square inch and an ultimate strength of 220,000 pounds per square inch.

3. This grid fits snugly into the curved grooves, which provide a scientifically cut bearing surface for the grid. This bearing surface extends from the outer to the inner edge of the grooves. The grid bears on the grooves in proportion to the load.

4. Under light loads, the grid bears only at the outer edges of the grooves. This permits a long, free, elastic span between the outer edges of both hubs. Power is transmitted through almost the entire length of the grid rung.

5. Under normal loads, the grid bears on a larger area of the grid grooves and the span of the grid run is shortened. It transmits more power and maintains its capacity to absorb shocks and dampen vibration.

6. Under peak loads, the grid rungs bear over almost all of the curved surfaces of the grooves. The span of the grid rung becomes very short. Under the impact of shock loads the grid flexes and continues to transmit power smoothly.

Twenty-two years of user experience in couplings have given Falk the service factors which indicate the proper cushioning in a circular plane. They transmit power smoothly, reduce shock, dampen vibration, cushion peak loads between power source and producing unit. Above all, they furnish the highest protection to your connected machinery—with a consequent reduction in maintenance costs, production delays and breakdowns. . . . Falk Steelflex Couplings are readily available. Stocks are maintained by carefully selected distributors at strategic locations.

FALK Steelflex Couplings

reduce your long-range coupling costs . . .

give maximum protection and low maintenance

Many far-sighted plant men in industry twenty-five years ago specified and installed Falk Steelflex couplings.

At the largest saw mill in the world on the west coast 1000 Steelflex couplings have proved that this was good judgment. Since 1922 these couplings have given good service protecting bearings from damage by accidental misalignment.

Today—after twenty-five years of operation, these maintenance men find spare parts' cost to be low. Replacing gridmembers worn to the breaking point costs only a fraction of the complete coupling.

Our improved symmetrical design gives further assurance of protection and long life with normal low maintenance cost.

* * *

Falk Steelflex Couplings offer three distinct advantages which combine to lower your coupling costs:

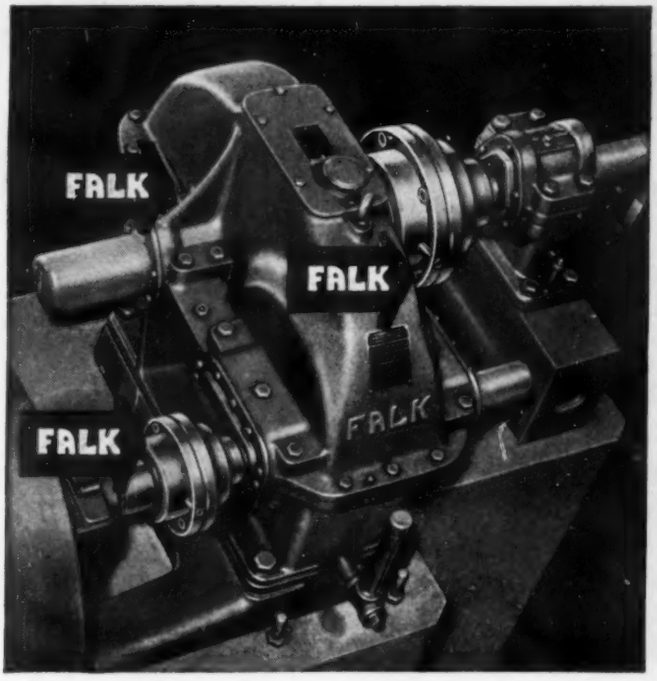
Torsional Resilience: The grid-groove design permits spreading of the peak of shock loads over a longer time, thus reducing stresses in your connected machinery.

Flexibility: Falk Steelflex all-steel construction assures greater flexibility in actual service . . . and prolongs machinery life.

One Type for Most Uses: Falk Steelflex Couplings meet practically all industrial installation requirements. This fact facilitates buying, replacing, or servicing couplings promptly.

* * *

Our bulletin 4100 tells you what you should know about Falk Steelflex Couplings. Write for it today.



Throughout Industry... from Power to Production it's...

FALK

..a good name in industry!

THE FALK CORPORATION • Milwaukee 8 Wisconsin
Established 1892

Precision manufacturers of Speed Reducers... Motoreducers... Flexible Couplings... Herringbone and Single Helical Gears... Heavy Gear Drives... Marine Turbine and Diesel Gear Drives and Clutches... Steel Castings... Contract Welding and Machine Work. District Offices, Representatives, or Distributors in principal cities.

want...
longer bearing life?

SUPERFINISH
...assures it!

● Yes, you can double—triple—quadruple—the life of bearings with simple, precautionary measures which take only a few minutes.

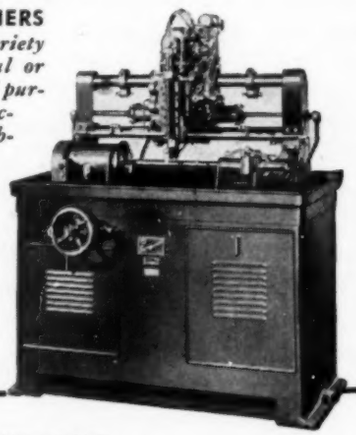
Examine a finely ground surface. No matter how smooth it may appear, it has defects in the form of grinder scratches, chatter and feed marks, and "smear metal" softened by the heat of grinding wheels. When these tiny metal ridges rub together, they rupture the protective oil film to cause scoring, excessive wear and increased clearances.

Superfinishing removes these defects—produces a bearing surface that is virtually frictionless. And its life is almost unlimited.

Superfinishing is a much quicker and more economical process than you may think. And it pays for itself many times over in better service and lower replacement cost.

Ask your nearest Gisholt Representative for the facts about Superfinishing.

GISHOLT SUPERFINISHERS *are available in a variety of types for cylindrical or flat surfaces; for general purpose or continuous production work; also as attachments for use on lathes. Write for literature.*



GISHOLT MACHINE COMPANY · *Madison 3, Wisconsin*

TURRET LATHES · AUTOMATIC LATHES · BALANCERS
SUPERFINISHERS SPECIAL MACHINES

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface finishing and balancing of round or partly round parts. Your problems are welcomed here.

In Every Set-up . . .

CLE-FORGE HIGH SPEED DRILLS

TRADE MARK REG. U.S. PAT. OFF.

PRODUCE MORE HOLES PER GRIND

Whether it's a single or multiple spindle job, CLE-FORGE High Speed Drills always give you the biggest dollar-for-dollar value. In every drilling operation, they produce *more holes per grind.* ✧ The same economy can be obtained with other CLEVELAND tools—Reamers, Screw Extractors, Arbors, Mandrels, Sockets, Mills, Counterbores and MO-MAX High Speed Ground Tool Bits and Cut-off Blades.

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I INDUSTRIAL SUPPLY S DISTRIBUTOR D

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
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TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

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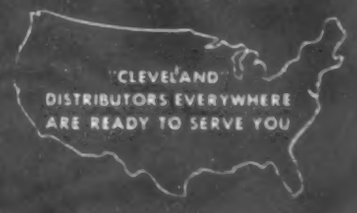
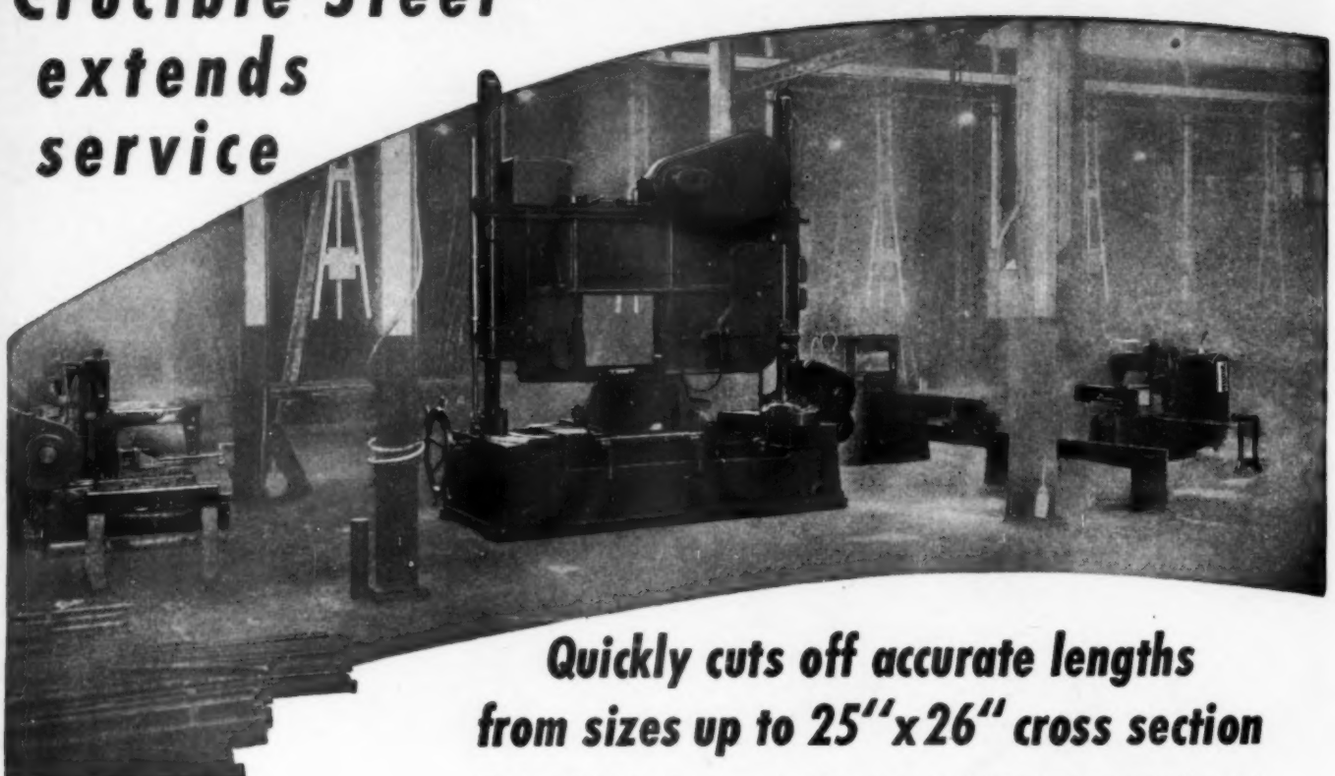
B. R. BARRUS, LTD., BRUNEL RD., ACTON, LONDON, W. 3, ENGLAND



Crucible Steel extends service



Quickly cuts off accurate lengths from sizes up to 25"x26" cross section

The Crucible Steel Company of America with 26 branch warehouses and sales offices, has built a reputation for anticipating customers' needs, not only in high grade and special steels, but in service requirements as well. They were among the first to equip several of their warehouses with modern high speed MARVEL Saws (No. 6 and 9A series) in order to give fast service on either single lengths or large quantities of identical pieces, accurately cut from bars up to 10" x 10" cross section. Now in anticipation of new demands for larger sizes, they are the first steel company to install a No. 24 MARVEL Hydraulic Hack Saw in order to give fast service on orders for steels of any type *in sizes up to* 25" x 26" cross section.

This giant hack saw, which almost qualified as a "secret weapon" because it contributed so materially to our production capacity in building naval ordnance, applies an entirely new principle of reciprocation that has made "hacksawing" of large work practical for the first time.

Whatever your metal sawing problems, there is a MARVEL Saw exactly suited to your needs. A MARVEL field engineer will be glad to go over your metal sawing problems with you.

No. 24 MARVEL giant Hydraulic Hack Saw. (capacity 24" x 24"). Employs new "Roll Stroke" sawing action and trouble-free low pressure hydraulic control.

No. 9A MARVEL Production Saw (capacity 10" x 10"). Automatically feeds, measures and cuts-off identical lengths from single or nested bars with no more operator attention than an automatic screw machine.

No. 6 MARVEL Saw (capacity 6" x 6"). A high-speed, heavy-duty, all-ball-bearing saw—operates up to 149 strokes per minute, cuts thru 64% of each stroke, returns in 36%.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE, CHICAGO 39, U.S.A.

No. 1, No. 2 Series Capacity: 4"x4" Capacity: 6"x6" | No. 4B Series Capacity: 6"x6" | No. 6 Series Capacity: 6"x6" | No. 9A Series Capacity: 10"x10" | No. 8 Series Capacity: 18"x18" | No. 18 Series Capacity: 18"x18" | No. 24 Series Capacity: 24"x24"

MARVEL SAWS

. . . for Copper

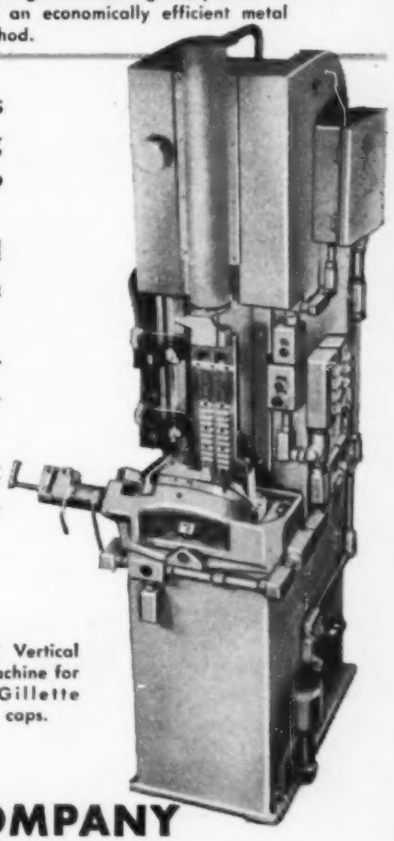
Over and over again Broaching has proved its superiority as an economically efficient metal removing method.

Soft, ductile copper alloy has by its very softness been the nemesis of many a machine operation. Sure; its corrosion resistance, its plating qualities and its looks are all superior product properties — but try to work it fast and smooth — and in one operation, too!

Broaching does it on a standard machine with Lapointe designed broaches. The secret's in the broach — constant pressure with just enough 'bite'.

Take razors as an example — it's been a four operation job. Broaching cuts two costly operations right out and delivers the shaped blade-holder to a tolerance never before achieved ready for plating.

If copper is your metal ask a Lapointe field engineer for the latest on cost cutting techniques for copper — or write to Lapointe, mentioning Department 44.



2½-ton 18" Vertical Hydraulic Machine for broaching Gillette safety razor caps.

HUDSON LAPOINTE MASS.

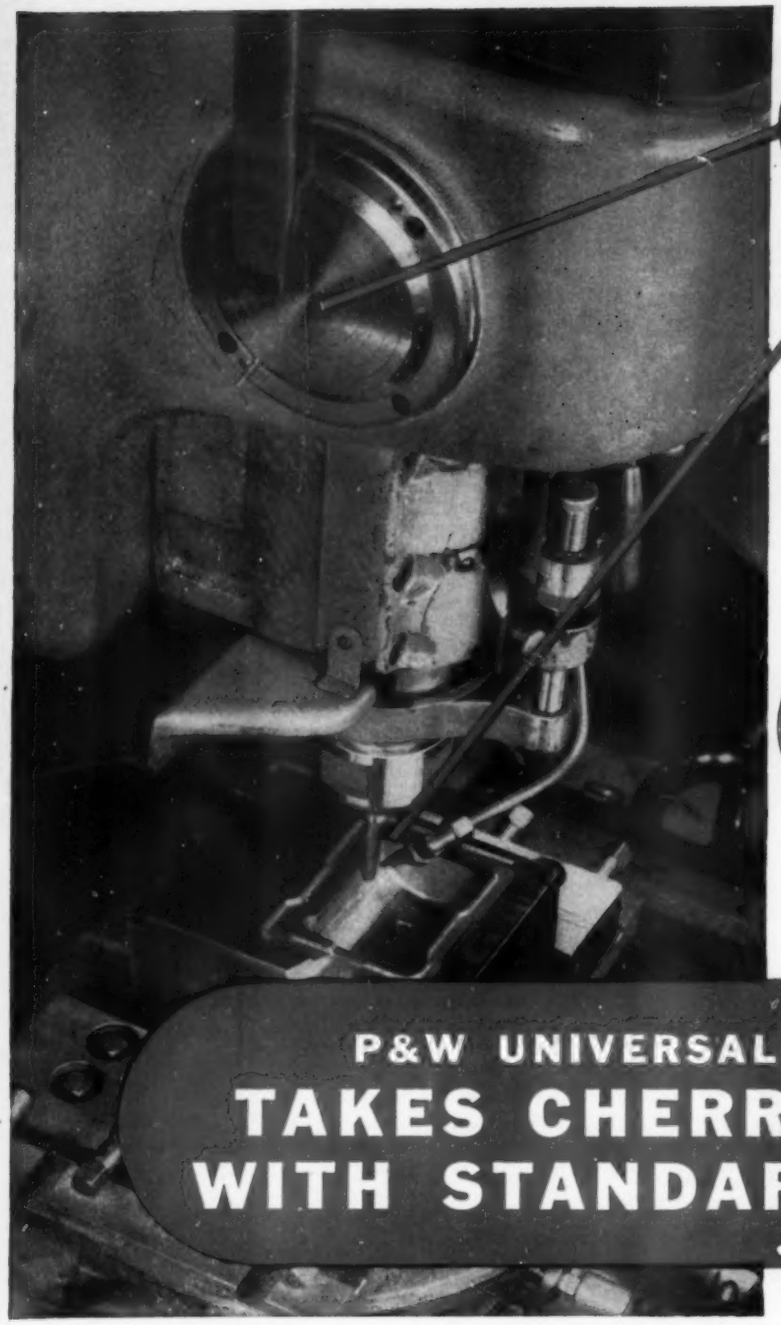
THE *Lapointe*

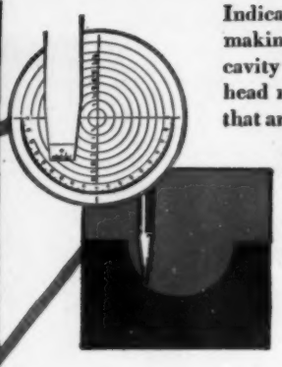
MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

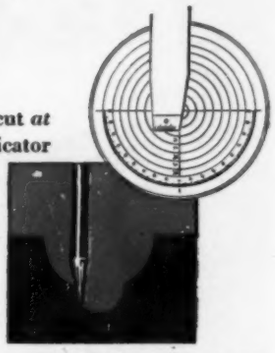
Branch Factory • Edgware • Middlesex • England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

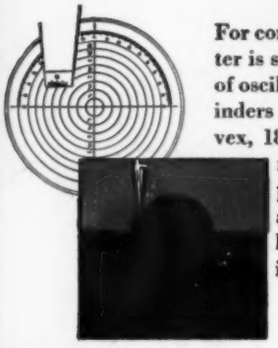




Indicator marks position of cutter making finishing cut over cylindrical cavity in tough die steel. Oscillating head makes easy work of many jobs that are either very difficult or impossible with ordinary die sinking equipment. With work held in a rotary vise, this can become a spherical cavity produced with equal ease.



Machine can take cherrying cut *at bottom of any cavity,* indicator again showing radius of cut. With work in rotary vise, this also can be a spherical cavity.



For convex cylinders or spheres, cutter is set to move through upper half of oscillator travel. Straight cuts, cylinders and spheres, concave or convex, 180° or any part of it, on any radius within limits . . . all are part of the day's work. These are the three basic cuts. Combinations of them in whole or in part are endless.

P&W UNIVERSAL DIE SINKER
TAKES CHERRYING CUTS WITH STANDARD CUTTERS

This feature gives you better dies at less cost wherever you put it to work. The P&W Universal Die Sinker's oscillating head, operating through adjustable eccentrics, does the job and eliminates much expensive hand finishing. This powerful modern machine lets you hog out heavy cuts, then finish so accurately that hand work and polishing is a matter of minutes. *And all this with ordinary, low-cost die-sinking cutters.*

Machine shown in the photo is Pratt & Whitney Universal Die Sinker 3B, one of a complete line you may have seen in action at the recent Machine Tool Show. Bulletin, sent on request, covers all models, both Plain and Universal.

PRATT & WHITNEY

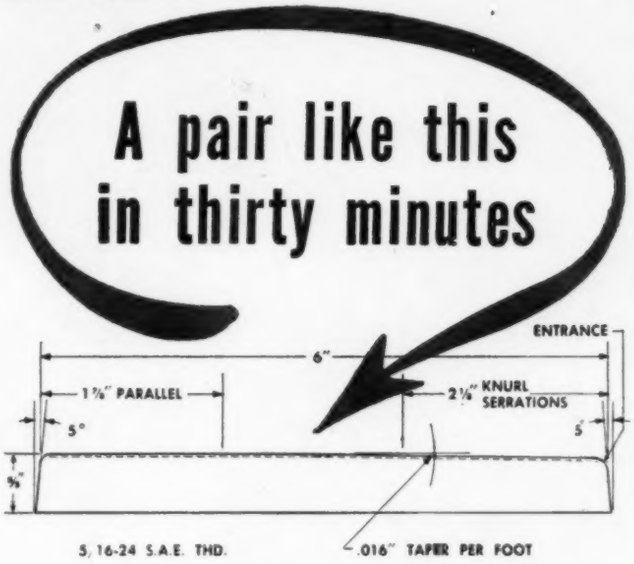
Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

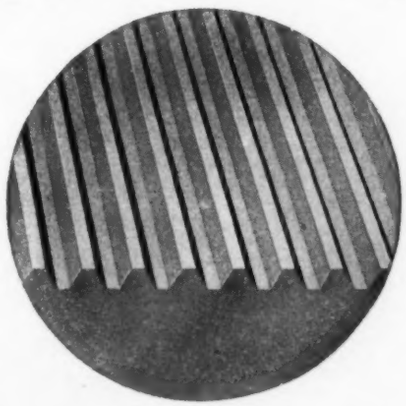
GRIND thread rolling dies?

...*the answer is* **YES!**

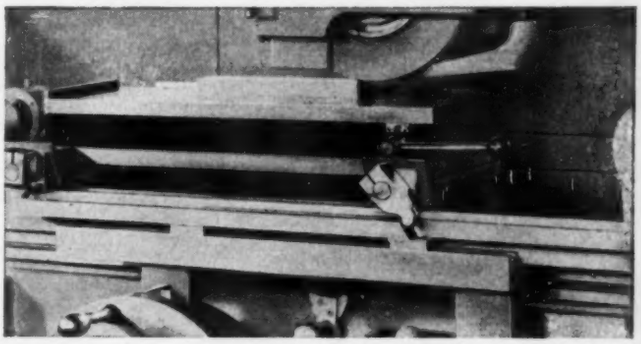
Now—through a new application of THOMPSON TRUFORMING—you can produce accurate duplicate roll thread dies and eliminate subsequent corrective operations formerly required. An example is the roll thread die shown here.



This is the Stationary Die (a perfect mate to the Moving Die not shown). Both were ground on a THOMPSON TRUFORM grinder from heat-treated alloy steel in less than thirty minutes. Note the radii, the precise taper and flat section. This is produced with a single cut—to full depth of thread form without resetting.



Enlarged tooth section shows form of threads and helix angle. By TRUFORMING dies are perfectly matched . . . there is no distortion.



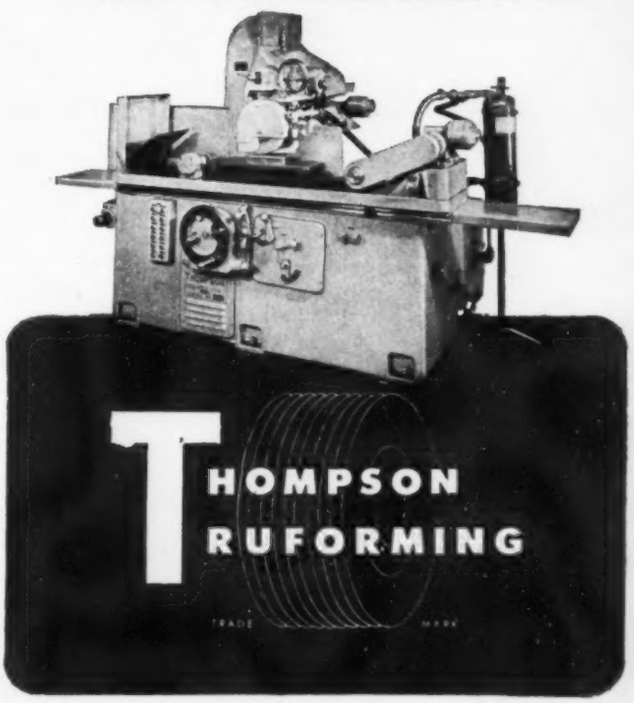
Deformities are eliminated by TRUFORMING because work is finished right in hardened steel. Note the special forming fixture in the photograph, which makes possible completely automatic and highly accurate grinding of the longitudinal contour. These Thompson die grinding features are new with patents applied for.

Longer die life and greater die accuracy, plus ability to regrind dies without drawing, are three great advantages you get with this THOMPSON TRUFORMING application.

Write at once for complete details . . . Address Dept. 12.

The Thompson Grinder Company • Springfield, O.

COPYRIGHT 1948, THE THOMPSON GRINDER CO., INC.



Same Job . . .
Same Operator . . .
Same Machine . . .
Same Productive Volume

but UNIT COST UP 35%

● Thousands of shops face this picture. After reconversion, they are again producing parts in the same volume as in the best prewar year. Operators' skill and machine productivity may be fully up to 1939 records.

But surveys of over 2500 metal working plants disclose that cost of materials, overhead, and labor are 35% above 1939.

To make up for these higher costs and yet maintain a satisfactory margin of profit without resorting to a steep rise in selling price, confronts management with a serious problem.

If your production processes include turning of metal parts, a Warner & Swasey field engineer may be able to help you. After studying your jobs, he probably can recommend improved machines, new tools and methods, or suggest accessories to be added to your old turret lathes to make them more productive.

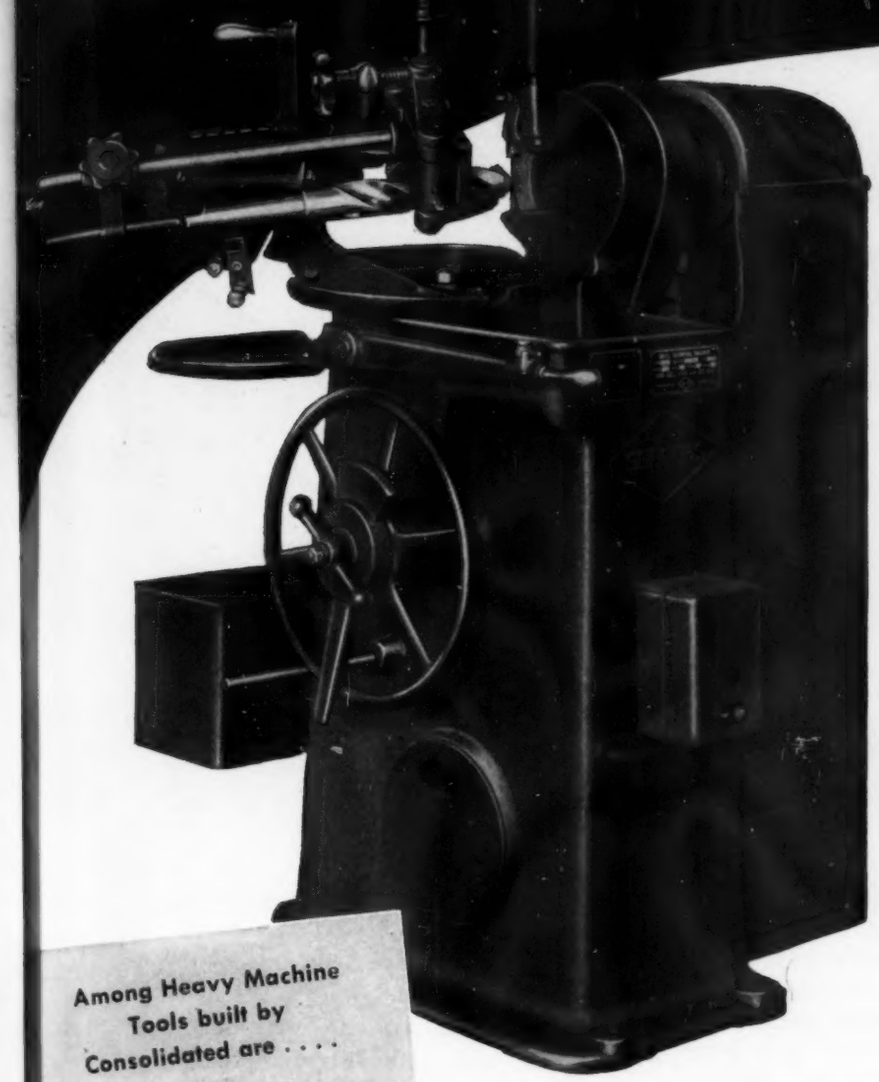
You can Machine it Better, Faster, for Less...
with a Warner & Swasey

WARNER & SWASEY
Machine Tools
Cleveland

TURRET LATHES, SINGLE & MULTIPLE SPINDLE AUTOMATICS, PRECISION TAPPING & THREADING MACHINES

MODEL
6-G

SELLERS DRILL GRINDER



QUICKLY PAYS FOR ITSELF IN DRILL MAINTENANCE SAVINGS

- **INCREASED PRODUCTION**
  Free cutting accurate drills permit drilling machines to be operated at their most efficient speeds.
- **LONGER DRILL LIFE**
  Less drill material is ground off when re-sharpening drills.
- **MORE HOLES PER GRIND**
  Correctly ground—drills remain sharp for a greater number of holes.
- **REDUCED ASSEMBLY COSTS**
  Eliminates under- and over-size holes. Saves reaming and boring.
- **RECLAIMS DAMAGED DRILLS**
  Sellers grinding method reclaims many burned and broken drills that are ordinarily scrapped.
- **ECONOMICAL**
  This Sellers Grinder has been known to have earned its original cost as many as six times over within a single year.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

The Sellers 6-G Drill Grinder provides an improved method of grinding that produces correctly formed drill points and duplicate lips. It automatically determines proper clearance according to drill size and grinds drills to equal length for use with multiple spindle drilling machines. This method materially reduces drill maintenance costs. A wet grinder that is especially adapted to grinding high speed twist drills from ¼" to 3" diameter.

Send for complete information

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

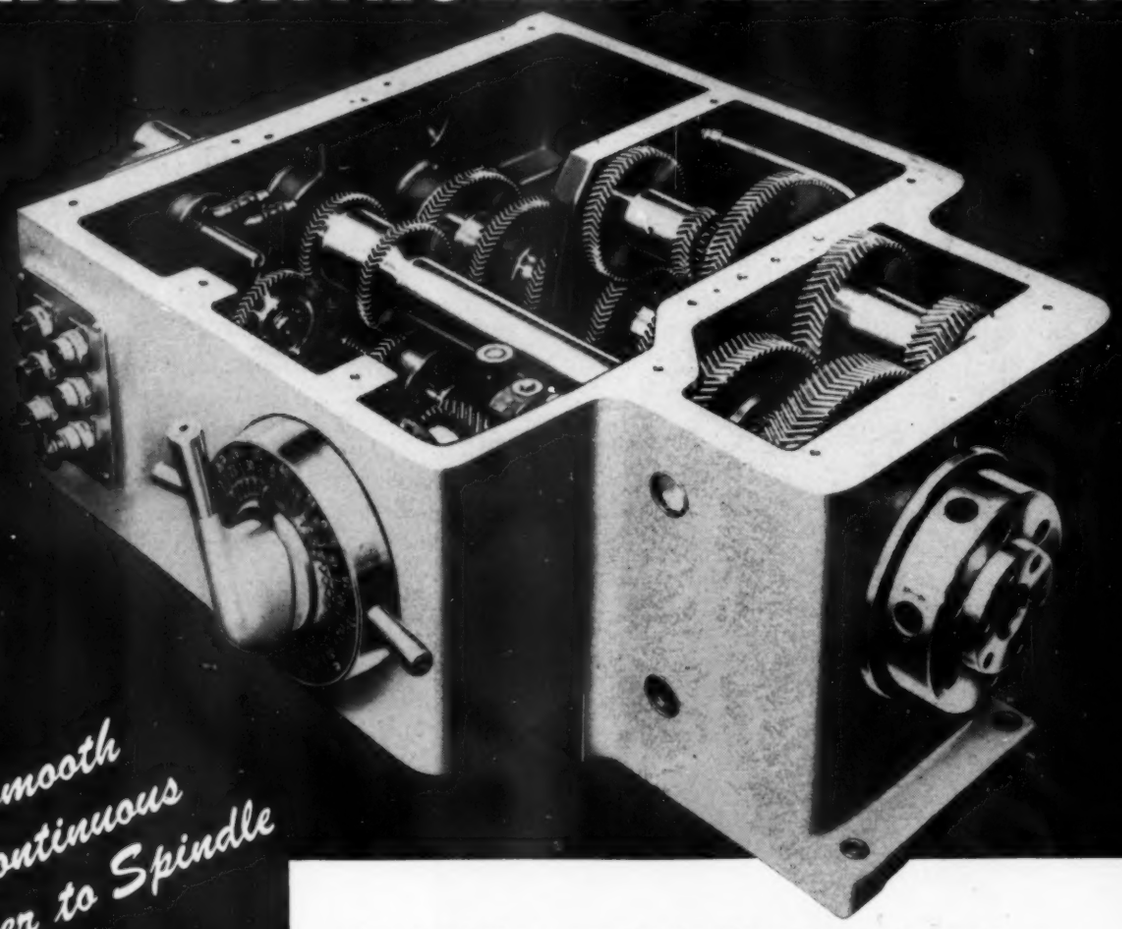
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

SIDNEY'S 32 SPEED DIAL CONTROLLED HEADSTOCK



Smooth Continuous Power to Spindle

The herringbone gears in the Sidney headstock provide more tooth contact resulting in greater strength, smoother action with end thrust eliminated through the double opposed helix angles. Accurate tooth contour, gradual engagement and oblique lines of contact assure correct tooth action and reduces wear to minimum. This headstock also features a spindle mounting which automatically compensates for expansion caused by temperature rise. The ideal transmission for carbide tools. The herringbone geared headstock has been an exclusive Sidney feature since 1925.

SIDNEY MACHINE TOOL COMPANY
SIDNEY Builders of Precision Machinery Since 1904 OHIO

Production gaging with External Comparator No. 951 and Amplifier No. 950.

NEW! Electronic

● EXTERNAL ● INTERNAL

Precision gaging on a mass-production scale is now both practical and economical for any plant or laboratory! The new Brown & Sharpe Electronic Measuring Equipment applies electronic super-sensitivity to measurement, and electronically amplifies the results for instant, accurate reading on a large calibrated dial. It enables accurate gaging to .00001", as fast as test-pieces can be handled.

An outstanding advantage of this new Electronic Measuring Equipment is the separate amplifier unit, which isolates heat-producing elements and prevents temperature drift in gaging units. Another unique feature is the true linear response of the gaging units, which permits accurate setting for the entire scale with only one gage block or master. These are only two of *many* advantages.

Get the full story of this versatile new Electronic Measuring Equipment. Write for details. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

We urge buying through the Distributor

Speedy internal gaging with Internal Comparator Attachment No. 952, Amplifier No. 950 and Signal Light Attachment No. 958 (optional).

Gage Head Cartridge No. 953 is shown mounted in special fixture for linear gaging.

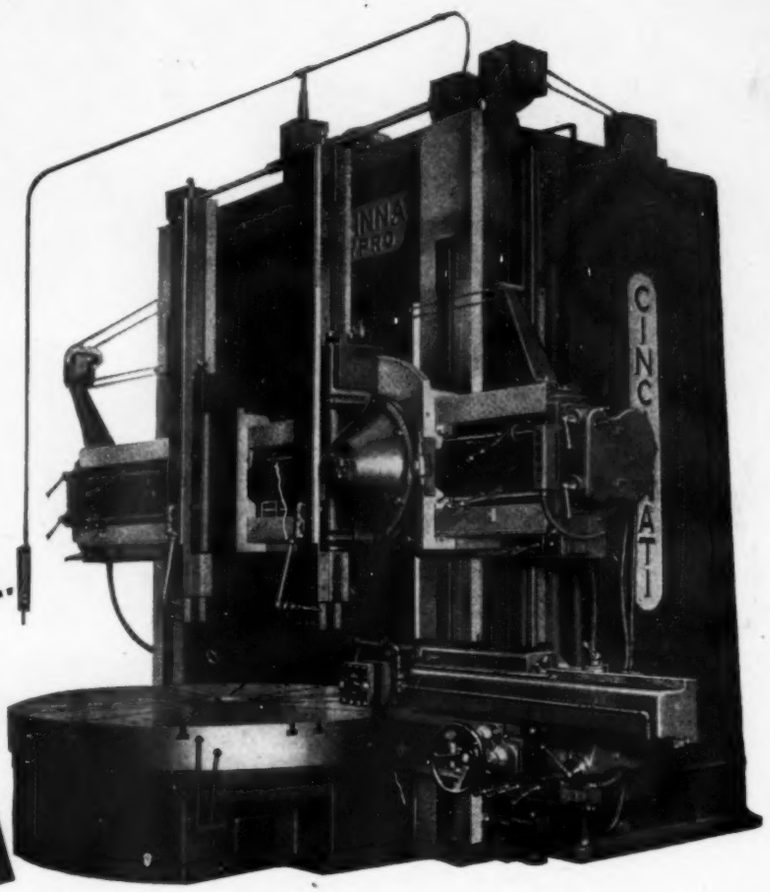
BROWN & SHARPE

FINE INCREMENT SPEED CONTROL—Multi-point, fine increment motor rheostat controlled from operators position, eliminates compromise speed settings, inevitable with conventional gear changes. Exact cutting speed assures maximum production.

TAILORED TABLE SPEEDS—On work of varying diameter table speed may be continuously adjusted for maximum production, without stopping table, without shifting gears and while tools are cutting.

SET UP TIME REDUCED—Fine increment table inching control in forward and reverse directions with dynamic braking.

OPERATOR'S FATIGUE ELIMINATED — Complete control of all motors from single accessible pendant station, plus absence of table clutch and brake shifting lessens operator's fatigue.

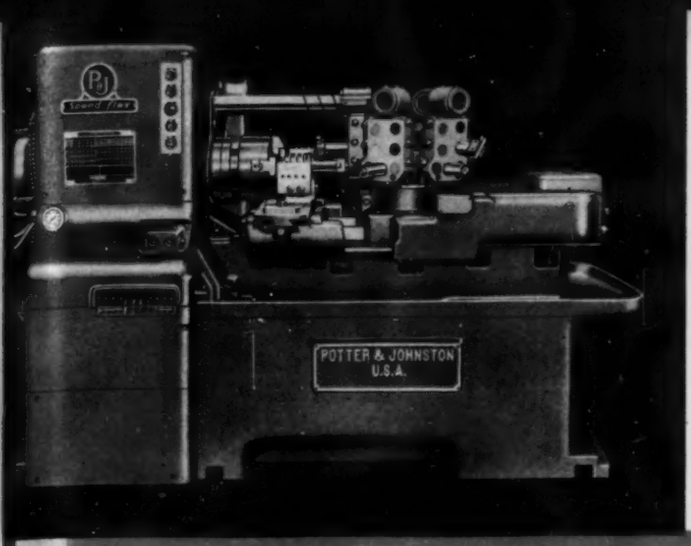


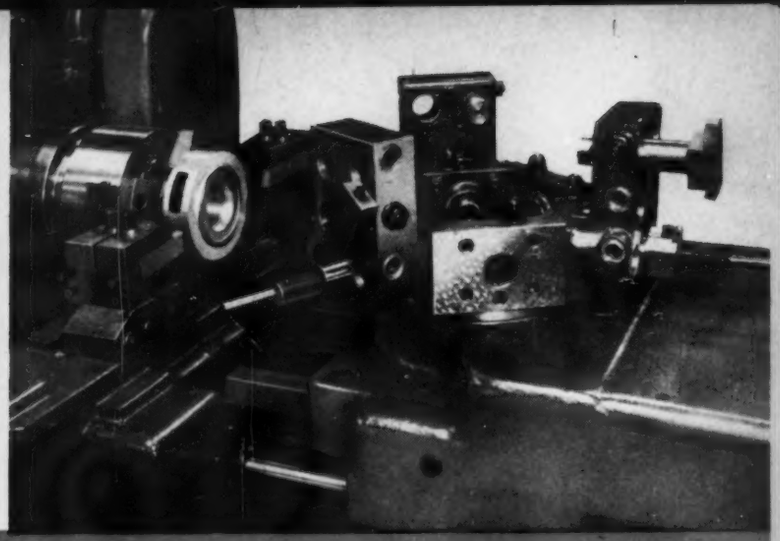
Effortless Control
COMES WITH
CINCINNATI
HYPRO
SPEED CONTROL

CAN NOW BE FURNISHED ON ALL HYPRO BORING MILLS IN FOLLOWING SIZES:

54"—64"—6'—7'.
7' widened to 8'. 8'—10'—12'.
12'—16' Extension type.

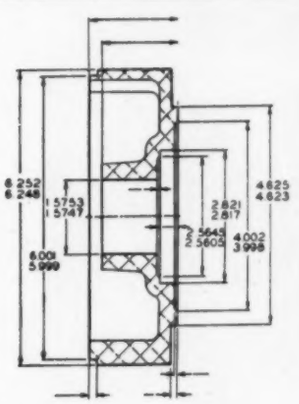
THE CINCINNATI HYPRO PLANER COMPANY
PLANERS · BORING MILLS · PLANER TYPE MILLERS
CINCINNATI, OHIO





THE LATEST, FASTEST P&J AUTOMATIC TURRET LATHE - *the* 3U SPEED-FLEX

..averages 1.36 minutes .per piece on this job...



THE rate of production on the job shown here is 44 pieces per hour with the machine operating at 100% efficiency. At 85% efficiency, the production averages 37.5 pieces. Note the size of the work being handled as well as the range of operations performed *automatically*.

The 3U SPEED-FLEX (with spindle speeds ranging from 73 to 1445 RPM and dual ranges of 36 to 711 RPM and 73 to 1445 RPM) has a swing over cross slide of 8¾", cross slide travel 2½" (each way) and turret slide travel of 6". It will handle the machining of castings and forgings up to 6" in diameter with speed, convenience and economy, versatility in tooling making it possible to assure effective and efficient set-ups. It is fully automatic with the exception of loading and unloading, feed and speed changes being electro-pneumatically controlled and turret automatically clamped in position after indexing.

These and other outstanding features of the 3U SPEED-FLEX are fully described in illustrated literature available on request.

POTTER & JOHNSTON MACHINE CO.

Pioneer Manufacturer of Automatic Turret Lathes

PAWTUCKET, RHODE ISLAND

DETAILS OF JOB

Part: Mounting End Plate

Material: Aluminum

Method and Operation: Presenting open end to spindle, grip on hub with 3 jaws; position with 3 stop pins at web

Machine as follows:

1st T.F.: Rough bore hole; machine counterbores; rough turn O.D.; turn and face 4.625" dia.; face both sides at rim; form turn 6.000" dia.

2nd T.F.: Blank

3rd T.F.: Finish the above

4th T.F.: Blank

5th T.F.: Size turn 4.625" dia.

6th T.F.: Blank

Allow sufficient stock for precision finishing.

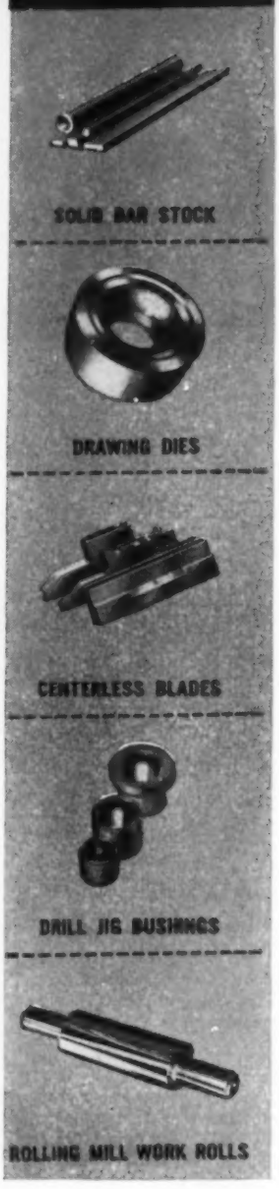
•

Send samples of parts or drawings for time study and report.

TO YOU IN * 24 HOURS OR LESS

Talide
(TUNGSTEN CARBIDE)
Cutting Tools

TALIDE METAL MEETS EVERY REQUIREMENT



Talide Tools reach you in perfect condition. They are plastic dipped for protection in shipment or storage.

Why wait for carbide cutting tools or tips when they are quickly available from a Metal Carbides warehouse. Fast delivery service of Talide (the hardest metal made) is assured by a call to one of the following warehouses:

Newark, N. J., 166 Bloomfield Avenue.
HUmbolt 2-2004
Youngstown, Ohio, 107 E. Indianola Avenue.
Youngstown 2-8167
Chicago, Ill., 601 N. Milwaukee Avenue.
Haymarket 1071

Talide QUALITY NEVER VARIES

Metallurgical consistency is a feature of TALIDE tungsten carbide. Talide tools give you 25 times the life of steel tools on every order. *Talide metal lasts longer because quality never varies.*

Send for Engineering-Style Catalog 46-T "STANDARD TALIDE TOOLS and TIPS"

SINTERED CARBIDES — MC TALIDE — HOT PRESSED CARBIDES

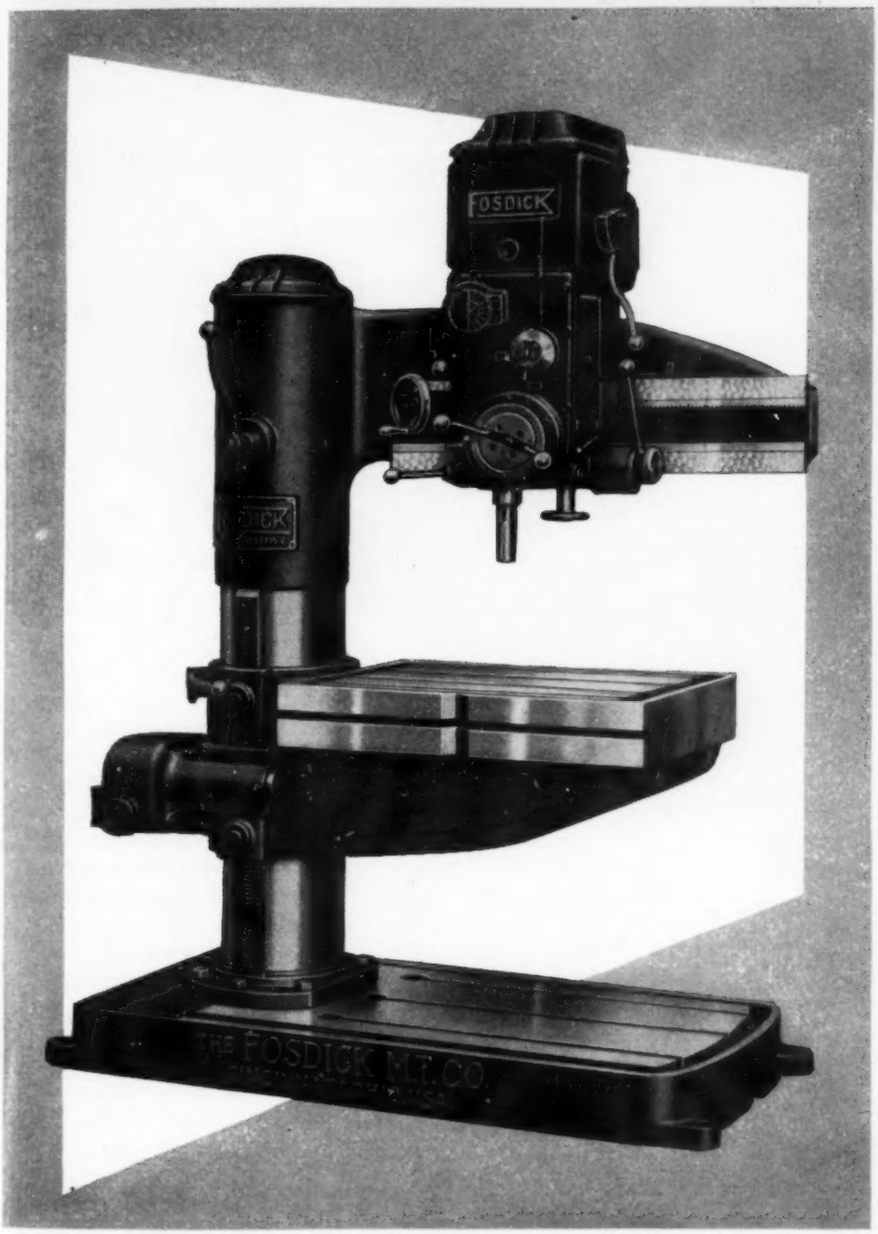
METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS

NEW · · · DIFFERENT *and* FLEXIBLE

FOSDICK
Sensitive RADIAL



● Here's a combination Radial and Sensitive Drill that fills a long felt need for a high speed sensitive drill with the advantages of flexibility offered in radial design.

This machine differs from the conventional design in that it has the arm at a fixed height and a movable table in addition to the customary base. Both the arm and the table can be swung in an arc of 360°.

The movable table may be raised or lowered either by power or hand and permits locating table easily and quickly to the proper position for the job at hand. When power is used the control for the motor is interlocked with the clamping and unclamping of the table.

Another advantage is the key fitted into the column to insure table raising parallel to the base at all times. The table being mounted on the column permits it to be swung behind the column and taller jobs can be mounted on the base.

It has all the normal advantages of a sensitive drill as to range of feeds and speeds plus the convenient operating features of a radial.

Get all the details. Write today for the new Fosdick Sensitive Radial Bulletin—S.R.A.

●

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

Steel-Weld FABRICATION

Welded Steel is now being employed to a greater extent every day for machine bases and frames, and in the construction of large units of heavy machinery, marine diesels, steam shovels, petroleum catalytic processing equipment and numerous other uses where expensive castings and riveted plate work were formerly employed.

The Mahon organization, with every modern facility for producing, normalizing, stress analyzing, sand blasting, machining and painting, stands ready to meet your requirements promptly and economically—regardless of design, size, or weight. A staff of thoroughly competent design engineers and highly skilled craftsmen are your assurance of a better, smoother appearing job embodying every advantage of Steel-Weld Fabrication.

THE R. C. MAHON COMPANY
DETROIT 11, MICHIGAN

Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

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ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

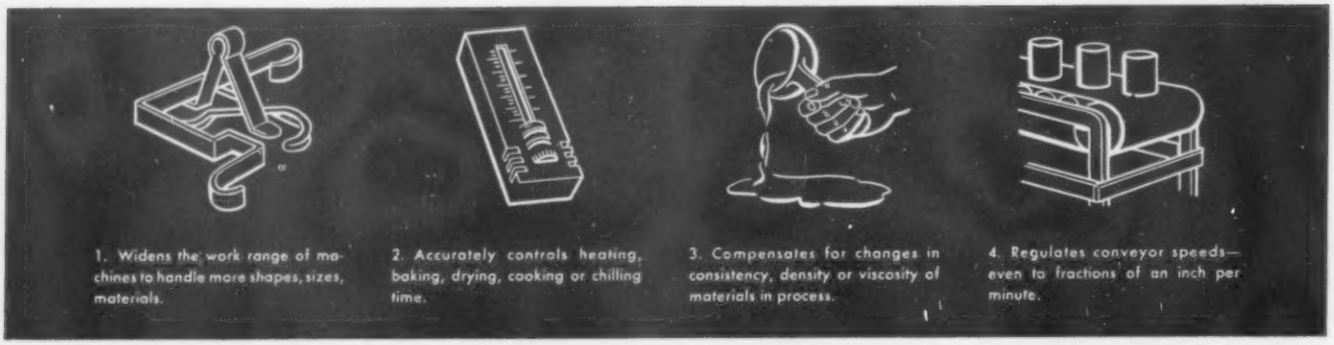
ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. Armstrong Ave. Chicago 30, U.S.A.

San Francisco and New York

8 Ways Reeves Speed Control Increases Production–Improves Quality

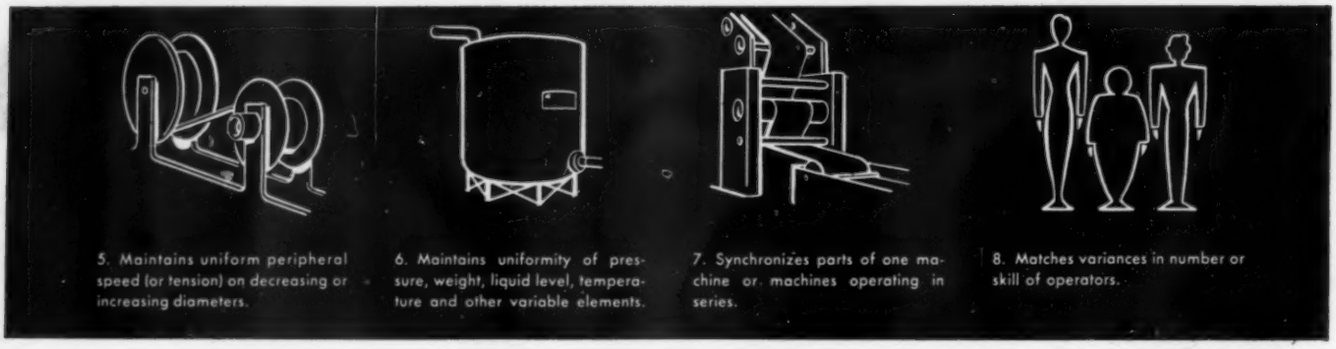


1. Widens the work range of machines to handle more shapes, sizes, materials.

2. Accurately controls heating, baking, drying, cooking or chilling time.

3. Compensates for changes in consistency, density or viscosity of materials in process.

4. Regulates conveyor speeds—even to fractions of an inch per minute.



5. Maintains uniform peripheral speed (or tension) on decreasing or increasing diameters.

6. Maintains uniformity of pressure, weight, liquid level, temperature and other variable elements.

7. Synchronizes parts of one machine or machines operating in series.

8. Matches variances in number or skill of operators.

Here's the tested and proved way to get instant, stepless speed adjustability on your machines—assuring exactly the right speed for every job, under every changing condition.

REEVES Speed Control is standard equipment on more than 2,100 different makes of machines and is easily applied to your existing machines. Units are available in the widest variety of types, sizes, capacities and speed ratios with manual, push button or automatic control.

It's the positive answer to improved quality, higher production and lower manufacturing cost. Our experienced Speed Control Engineers will be glad to help solve your problems. Write today for the new 114-page catalog A-450A.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

Accurate Variable

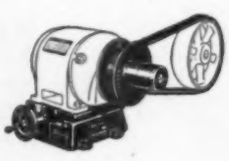
REEVES Speed Control

Gives the Right Speed for Every Job!

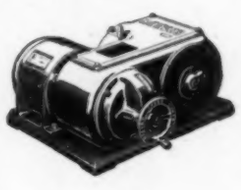
THE THREE BASIC REEVES SPEED CONTROL UNITS

VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—frattional to 87 hp.

VARI-SPEED MOTOR PULLEY provides an instantly variable speed drive within 4:1 ratio for any constant speed motor. Sizes to 15 hp.



MOTODRIVE combines motor, speed varying mechanism and reduction gears in single compact unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 15 hp.



American Machinist's Spot NEWS OF METALWORKING

A plan to take goods in exchange for machine tools is being worked out by a group of British machine tool builders who are trying to boost their foreign sales to conform to their government's request. The plan is now being tried out on a small scale.

Italian government has announced that it will purchase $50 million of surplus government machine tools from War Assets Administration. WAA has extended credit to Italy for this purpose.

The feasibility of bringing back battlefield scrap is to decided by a joint government-industry commission which is going to Germany. The rapidly rising domestic price of scrap, plus the critical shortage here, is believed to make profitable a return of such scrap to this country.

At least 15% more steel sheet tonnage will be supplied domestic customers by steel mills in 1948 than during 1947, according to a survey made by one of the nation's large steel users.

Embargo on machine tools and other production equipment shipped to Russia will not be put into effect in the immediate future. Economic sanctions will not be applied for two reasons: (1) trade with Russia has dropped to a low level anyway, and (2) vitally important manganese and chrome ore are being imported from Russia. Exports to Russia in final quarter of 1947 are likely to be only $20 million.

General Motors is setting up a group of men representing various plants in an endeavor to exchange valuable engineering and production ideas. If something clever is developed in Buffalo, for example, it may be put to work in Flint, Mich. Chemical and production engineers and maintenance men, as well as production men, are to be included in this group.

Extrusion of gear blanks with the teeth formed in them is a revolutionary production process now in the development stage. Only a finishing cut is required to complete the toothed periphery.

Refusal of CIO Mine, Mill and Smelter Workers officials to file non-communist affidavits with NLRB has begun to hurt. This union's election petitions at the United States Time Corp., Waterbury, Conn., and two plants of the Torrington Co. were dismissed because of non-compliance with the Taft-Hartley Law.

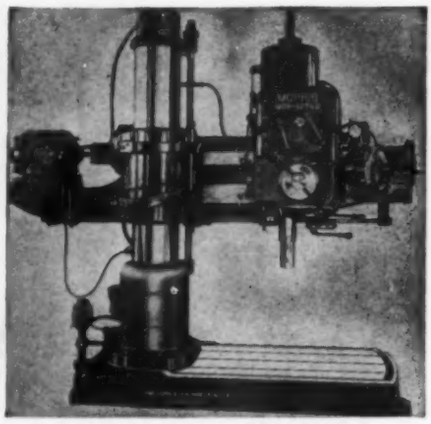
German machine tool output in the British and U.S. bi-zonal areas has been set at 49% of the prewar production. The value set on this output is $68 million. The present production rate is estimated at $108 million and this figure will be cut by removal of 25 machine tool plants in the form of reparations.

General Electric has backlog of about $750 million in heavy production equipment, of which $500 million consists of equipment produced by the apparatus department. This figure is 25% above a year ago in dollar volume, perhaps is up 10% in physical volume. President Charles E. Wilson believes that U.S. industrial production will be better in 1948 than in 1947.

Big automatic conveyor-type machine tools are being built in small sectional units for one of the important automobile makers. These units can be installed piecemeal without moving any surrounding production units, thus minimizing disruption of manufacture.

For greater production and lower costs

MORRIS MOR-SPEED 3-Way Horizontal Machine



MORRIS MOR-SPEED RADIAL

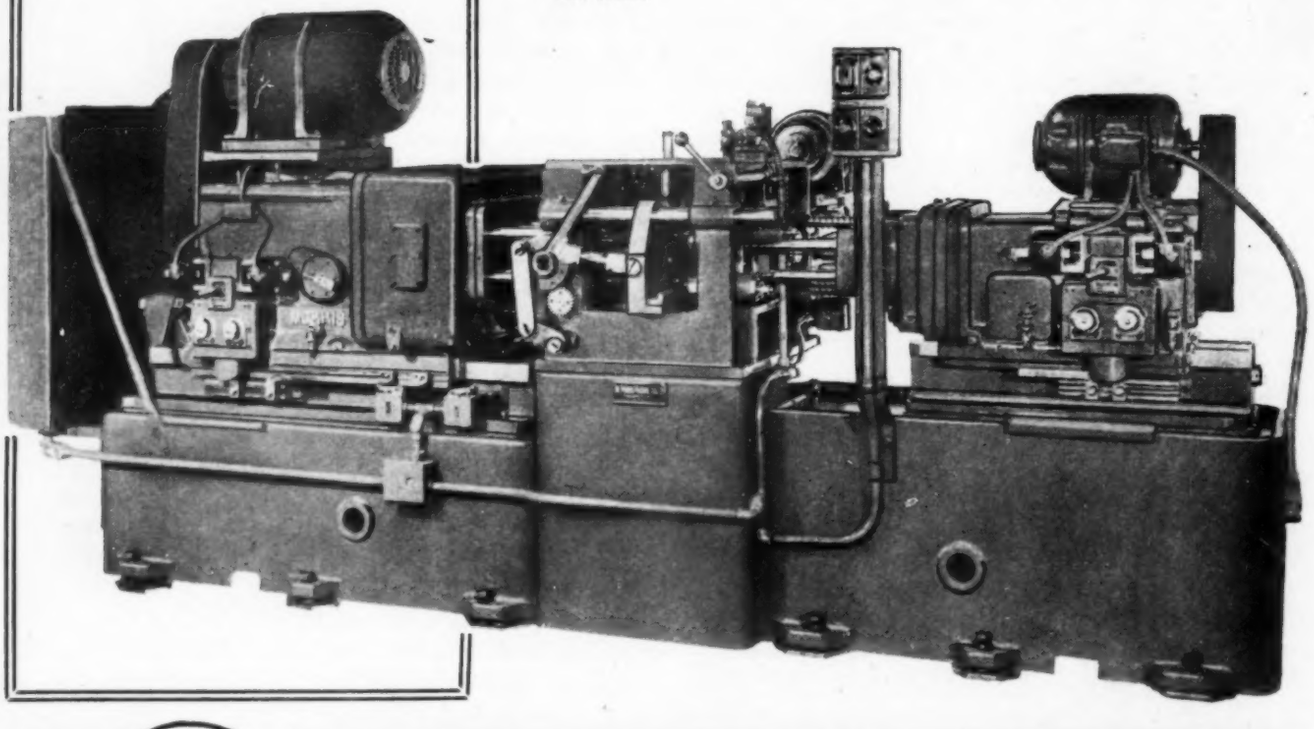
● In today's competitive market high production and low costs are essential to profitable output. Many prominent manufacturers have solved difficult production problems with Morris Mor-Speed Drilling Machines.

For example, the machine shown is a 3-way horizontal type with a 22-spindle left-hand unit, a 5-spindle right-hand unit—and a single spindle unit at the rear. All heads are powered with individual motors. Operator merely loads and unloads a hand clamped type of fixture as all machine functions are automatic.

This machine drills all the holes in the valve chamber cover of an automobile engine at one setting—a piece is completed at every cycle.

The machine is typical of hundreds of Mor-Speed drilling machines developed by Morris for specific job requirements.

If you have work requiring drilling—reaming—tapping, etc., on a mass production basis, consult Morris. They have the experience—the engineering "know-how" and facilities to help you increase production and cut costs.



Builders of MOR-SPEED Lines

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

How To Lower Prices

Prices eventually must come down to prevent our economy from blowing up. It is much better that they decline in orderly fashion, and by voluntary action on the part of industry, rather than under the pressure of depression.

The only way to get prices down is to reduce production costs. Chances of paring them in any other way are very slim.

It is unlikely that the general wage level will sag much below where it is today. High wages appear to be here to stay.

Raw materials prices are in rarefied atmosphere, too. Little relief is in sight.

There is only one recourse, then, if costs are to tumble. Industry must be more highly mechanized than it is today. Full advantage must be taken of the new automatic and semi-automatic machines developed since the war ended.

The possibilities for substantial cost savings in that direction are vast. Indeed, they are almost limitless.

What metalworking manufacturer can say truthfully, without tongue in cheek, that he has cut costs to the utmost as long as he has equipment of ancient vintage in his plant?

What manufacturer with a relatively modern plant and machinery can satisfy himself, and his board of directors, that at least part of his production equipment is not outmoded?

Go through a representative group of metalworking shops in any U.S. city and see for yourself. The amount of antiquated equipment still in use, the makeshift methods employed here and there, the extent to which human labor does jobs which can be done better by machines, immediately become apparent. Even the vaunted automobile industry, acme of mass-production technique, has its less impressive sights.

This lag in efficiency extends beyond machines to the movement of parts and materials. Much stuff is being lugged around today by hand that should be transported mechanically. The room for improvement, if anything, is even greater in materials handling than in plant equipment itself.

The truth is that productivity increases as individual workers are given more and more mechanical aids of all kinds. As productivity rises, production cost per unit declines.

What boundless opportunities for management to tackle this tremendous problem of costs!

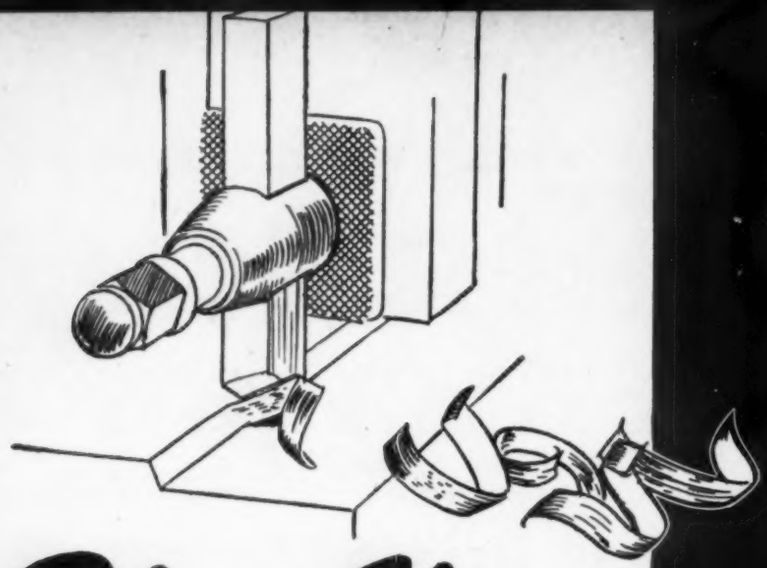
Costs will not be licked, however, unless management has the courage and vision to spend money to save money. It is a seven-day-a-week, twelve-months-a-year job. It means endless combing out of high-cost equipment in favor of low-cost machines, constant vigilance over production processes to make sure that materials are handled economically.

The management which practices this policy need not fear the future. It stands a good chance of being able to lower the price of its products even in the face of today's inordinately high hourly rates and raw materials prices.

Do not overlook the fact, too, that it will be in a strong competitive position to get business at the expense of its rivals when the inevitable buyer's market arrives.

Burnham Finney

EDITOR



Blue Chips

Cincinnati Shapers cut blue chips that are profitable chips. Blue chips come from tough die steels that present unusually tough machining problems.

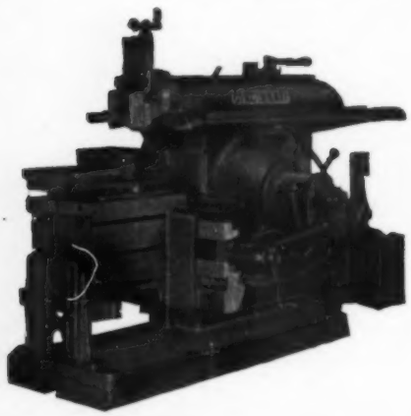
The machine must be accurate in performance, must deliver unusual power at the cutting tool, and must have great stamina. On these things hinges the profitable handling of these tough steels.

Cincinnati Shapers, with their outstanding performance, are found in large numbers in tool and die plants everywhere.

Our representative in your neighborhood will gladly consult with you on increasing accuracy and profit in your shop.

Our Engineering Department is at your service. Ask their advice on your shaping problems.

Write for Catalog N-3



• THREE TIMES AS TOUGH . . .
By test, die steels are often three times as tough as mild steel—and machining demands are correspondingly more severe.

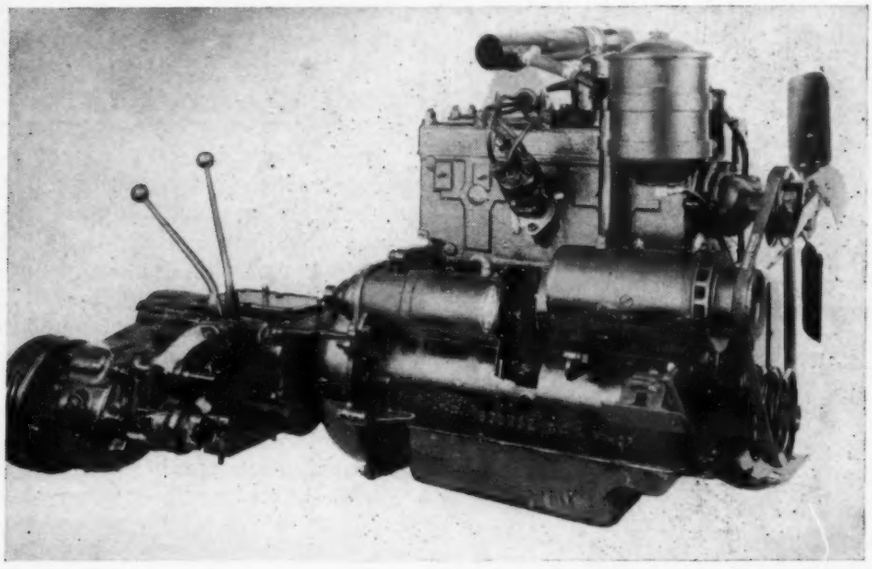
THE CINCINNATI SHAPER CO.
CINCINNATI 25, OHIO U.S.A.
SHAPERS · SHEARS · BRAKES

JEEP AND OFFSPRING.. Here the civilian Jeep (center) is surrounded by its derivatives (l. to r.): station wagon, fire truck, two-wheel-drive truck, panel delivery, four-wheel-drive truck, station sedan, and Jeepster

HOW THE JEEP DONNED CIVVIES

BY DELMAR G. ROOS

VICE-PRESIDENT IN CHARGE OF ENGINEERING • WILLYS-OVERLAND MOTORS, INC.



War's end left Willys-Overland with a proved and popular military vehicle. . . . Smart engineering and production planning converted it into a line of utility cars with standard, interchangeable assemblies. As told to E. J. Tangerman, managing editor . . .

WAR-KNOWN POWER PLANT REQUIRED LITTLE CHANGE

FAMILIAR to hundreds of thousands of G.I.'s, the Jeep's power plant could be put into civilian use with only a few changes. Major ones are:

1. Heavier counterweights bolted to crankshafts to reduce bearing load. They increase main-bearing life 150%, also connecting-rod bearing life, apparently because wear in main bearings formerly robbed oil from con. rods. Weights are too large to forge integral.

2. Timing chain replaced by direct gear drive.

3. Oil pump changed to Eaton type for greater reliability. The new one is bought outside, not Willys-made.

4. Put vacuum spark control on distributor to supplement centrifugal control on Jeep. Dual control is more reliable, sets spark to suit speed and load.

5. Added governor, optional on 2-wheel-drive truck, standard on 4-wheel-drive truck, recommended on agricultural jeep, to prevent engine abuse in low gear ratios.

This engine develops 60 bhp. @ 4000 rpm. and 105 lb-ft. torque @ 2000 rpm. (in truck) and 63 and 109-110 in station wagon (without accessories in all cases.) SAE rating is 15.6 hp.

THREE war's-end decisions were basic in establishing not only Willys-Overland policy, but also production methods. They were:

1. To build a line of utility vehicles, specialized for up-to-now neglected services.
2. To use the Jeep power plant in all.
3. To retain the Jeep "look" as a trademark.

Some 361,349 military Jeeps produced between May 2, 1941, and Aug. 20, 1945, had built an enviable reputation for sturdiness, speed and maneuverability over any reasonable terrain. The car had been widely publicized for such exploits as the 1500-Jeep evacuation of our troops from Kasserine Pass in Africa, and scouting trips on Jap-infested Pacific islands by Jeeps equipped with

JEEP DESERTS MARS FOR VULCAN

THIS universal (postwar) Jeep is based on the military model, but has changes necessary to produce a sturdier, better vehicle, particularly for agricultural use. Modifications are:

1. Bigger transmission to obtain lower gear reductions and increase service life. Lower gear reductions in transfer case and axles as well changed the total over-all reduction in the driving train from 26:1 to 37:1, providing greater power at low speed for plowing and tillage. Weak spots in the transmission low gear and in the axle differential were corrected.
2. Sturdier rear axle to handle loads and pulling.
3. Redesigned gasoline tank so it could be placed within the body, with only the filler spigot exposed. This removed a safety hazard.
4. Added a tail gate. This required redesign of the canvas top so gate could be used with top up and transfer of spare tire from back to side.
5. Replaced military electrical equipment with lighter, less-expensive, but adequate civilian units.
6. Replaced 5-in. special military headlights with standard sealed-beam civilian-car units.
7. Redesigned front and extra seats with deeper and more comfortable seat and back cushions. Rear seat made instantly removable without tools.
8. Raised steering gear to provide more-comfortable driving position with the deeper cushions.
9. Made windshield higher for greater visibility.
10. Redesigned exhaust system, raising muffler to avoid damage and reduce fire hazard when driving in weeds, straw and hay.
11. Improved steering geometry of front axle so heavy brake application does not affect steering control.
12. Added a step on each side to ease entry.

waterproofing gear and devices to prevent radio detection.

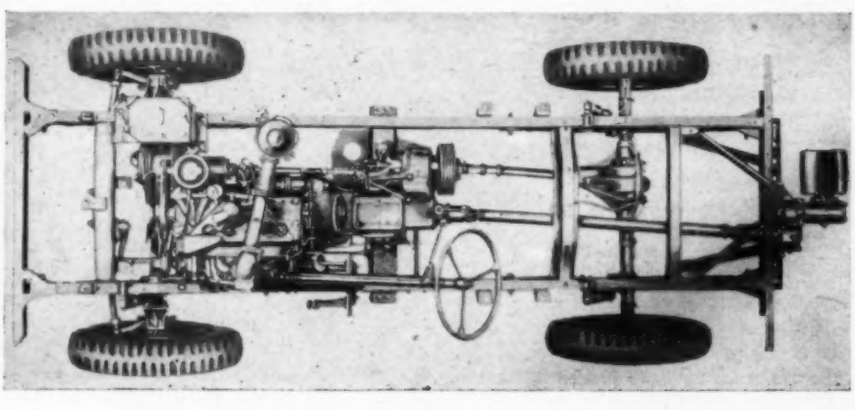
We felt that there was a definite civilian market for a modified Jeep in various utility versions, and that it should retain the appearance and characteristics of its military predecessor. Further, there was sound reasoning in this cost-wise, because we could glean business from the parts of the auto market thus far overlooked and avoid the expensive competition of year-to-year model changes.

Experience thus far proves these deductions correct. Extensive interchangeability of entire subassemblies in a variety of models increases manufacturing quantities and slashes tooling, production, assembly and service costs. As of Oct. 7, 1947, for example, we had produced 133,237 civilian Jeeps, 31,350 station wagons, 338 panel delivery trucks, 2,256 two-wheel-drive trucks and 1,600 four-wheel-drive trucks. Yet, for these five models, we produced 168,781 engines nearly enough alike that they could be made on the same line, 133,237 bonnets and radiator grids of one type and 35,544 of another. Generally speaking, for our present and immediate-future eight models we have no more than three subassembly types (see table).

The importance of this interchangeability may be further emphasized by pointing out that a single set of dies, jigs and fixtures for the Jeep front end costs $500,000. Broad standardization thus does more than attain recognition value—it saves real money.

UTILITY IS BUILT INTO THE CHASSIS

WHILE three different wheelbases are required for the line, a high percentage of the parts are interchangeable. This is the 80-in. wheelbase Jeep chassis, used also on the fire truck. It carries transfer case for 4-wheel drive and power takeoff. 4- and 6-cyl. engines are interchangeable on all 2-wheel-drive vehicles, but only 4-cyl. engines are used on 4-wheel-drive vehicles. The 104-in. wheelbase chassis for station wagon, panel delivery truck and the forthcoming Jeepster are identical, and overdrive can be put in.



Costs are vital in survival of Willys-Overland, because we are a small company. Producing with maximum economies and meeting needs that larger companies overlook can yield us an excellent business. Forty-five years of experience have taught us this lesson, for our company has faltered twice since it was formed in 1902 at Terre Haute, Ind. When the original Overland Company slipped, John N. Willys, automobile salesman, bought it for $350 in cash, a $7,500 personal loan, and assumption of $80,000 in debts. He moved the company to the Pope-Toledo plant in 1908, created a modern $1000 car two years later, and in 1915 was the world's second-largest producer, with 91,780 units.

In 1919, Willys-Overland developed the 4-cyl. engine that was the forerunner of the Jeep engine. Peak production, achieved in 1928, was 314,000 cars—but five years later came receivership.

Ward M. Canaday reorganized Willys-Overland in 1936, and in 1941 our engineering department designed the Army's G.P. (general-purpose) car, which soon became the Jeep.

Eight Models Have No More Than Three Types of Components

	Jeep & Fire Eng.	2-wh. Drive Truck	4-wh. Drive Truck	Sta'n Wagon	Panel Deliv.	Jeep-ster	Sta'n Sedan
Front Axle	A	B	A′	C	C	C	C
Rear Sxle	A	B	B	C	C	C	C
Front Brakes	A	B	B	C	C	C	C
Rear Brakes	A	B	B	C	C	C	C
Wheels	A	B	B	C	C	C	C
Clutch	A	B	B	B	B	B	B
Engine	A	A	A	A	A	A	B
Transmission	A	B	A	C	C	C	C
Generator & Regulator	A	A	A	A	A	A	A
Starter	A	B	B	B	B	B	B
Light Switch	A	B	B	B	B	B	B
Dimmer Switch	A	A	A	A	A	A	A
Head & Parking Lights	A	A	A	A	A	A	A
Tail & Stop Lights	A	B	B	C	C	C	C
Batteries	A	A	A	A	A	A	A
Distributors	A	B	B	B	B	B	C
Instruments	A	B	B	B	B	B	B
Radiator Grid	A	B	B	B	B	B	B
Bonnet	A	B	B	B	B	B	B
Front Fenders	A	B	B	B	B	B	B
Rear Fenders	A	B	B	C	C	B	C
Cowl	A	B	B	B	B	B	B
Dash Assembly	A	B	B	B	B	C	C
Windshield Assembly	A	B	B	B	B	C	B
Front door Assemblies	A	B	B	B	B	C	B
Forward floor stampings	A	B	B	B	B	B	B
Chassis	A	B	B	C	C	C	C
Gas Tank	A	A	A	A	A	A	A
Front Suspension	A	B	A	B	B	B	B
Steering Gear	A	A	A	A	A	A	A

CIVILIAN JEEP PLUS EQUIPMENT MAKES FIRE TRUCK

A SIMPLE modification of the Jeep, this fire truck required only addition of suitable accessories and equipment. A 375-gpm. 120-psi. pump operates from the front power takeoff, can draw from any water source. Light, compact and fast, it is particularly adapted to fighting fires difficult to reach with heavier usual equipment for industrial plants, institutions and rural communities. Tooling for this truck and the universal Jeep is of course the same, but differs from that on the other models. The front fender, for example, requires six parts, while on the other utility vehicles it is a single piece, although the heavy (18-gage) sheet metal is retained.

Many other adaptations of the Jeep have been made for industries and utilities, including line-maintenance trucks for power or power lines, prospecting, pickup (800-lb. capacity), compressor (60 cfm. @ 100 psi.), welding (200 amp. from center takeoff), hydraulic snow plow, towing tractor, winch, mower, sprayer, and so on—all alike in production.

STATION WAGON FATHERED UTILITY LINE

JULY 11, 1946, the first station wagon went into production. It has the familiar Jeep "front-end look" with radiator grid, bonnet, front fenders, cowl, dash, windshield assembly and door assemblies identical with those in panel delivery, 2- and 4-wheel drive trucks and the new station sedan. Front seat frames, cushions, springs, chassis, gas tank, front suspension, rear axle, steering gear and dash instruments are also used on panel delivery, station sedan and Jeepster.

The station wagon is all steel with simulated wood finish, seats six with an optional seventh seat, can cruise at road speeds of 65 to 70 mph.

PANEL DELIVERY HANDLES HALF A TON

IDENTICAL with the station wagon except for side panels and rear doors, this light delivery truck weighs 3,875 lb., will carry 1,050-lb. payload, is only 175 in. long over-all. Differences are so slight from other models that it can come down the same assembly line. Production began May 18, 1947.

JEEPSTER IS WILLYS' BID FOR BOBBY SOXERS

CALLED formally the sports phaeton, the Jeepster is going into spring production. From the cowl forward it is the familiar Jeep, but from there back it is new. Gear ratio is faster, and it is painted in fire-engine red with cream trim and added chromium. The truck rear fender, with aluminum "climb over the side" steps added, avoids a new set of dies there. The car goes back to side curtains and a fold-away top to keep costs down. Seats are upholstered in gray Vinylite

THERE'S A JEEP 1-TON TRUCK TOO

WHEEL BASE up to 118 in., 4,700 to 5,300 lb. gross weight, ¾ to 1 ton pay load, and seven body styles feature the 2-wheel-drive truck, introduced May 18, 1947. The standard Jeep engine is used, with the civilian Jeep carburetor; this cuts engine power and torque slightly, but makes production simpler. It has a conventional front axle and no transfer case. Frame, sheet metal, body, rear axle, muffler, radiator, steering gear, gas tanks, wheels and brakes are like those of the later 4-wheel-drive truck, thus it can be built on the same line, and a high percentage of parts are standard for either truck, the first time this has been done in automatic production. A variety of body styles are produced, including stripped chassis, chassis with cab, cab and pickup box in several variations, and cab and stake body as shown here

THE HEAVY TRUCK IS A MIGHTY MIDGET

ONE OF the lowest-weight 4-wheel-drive vehicles ever produced, this Jeep truck is like its 2-wheel-drive twin, except for transfer case and front axle. The latter is like that on the civilian Jeep, but tread is increased to the standard 56 in. A special Timken-equipped rear axle is available for heavy loads, and a power take-off (rear pulley unit shown) for special jobs. Here the truck is carrying a 1-ton load up a 51% grade. Body types include the stripped chassis, chassis with cab, cab and pickup box with several types of enclosures, and cab and stake body as shown on the 2-wheel-drive unit. This chassis is heavier than that in preceding cars, and has 118-in. wheelbase, but many parts are interchangeable

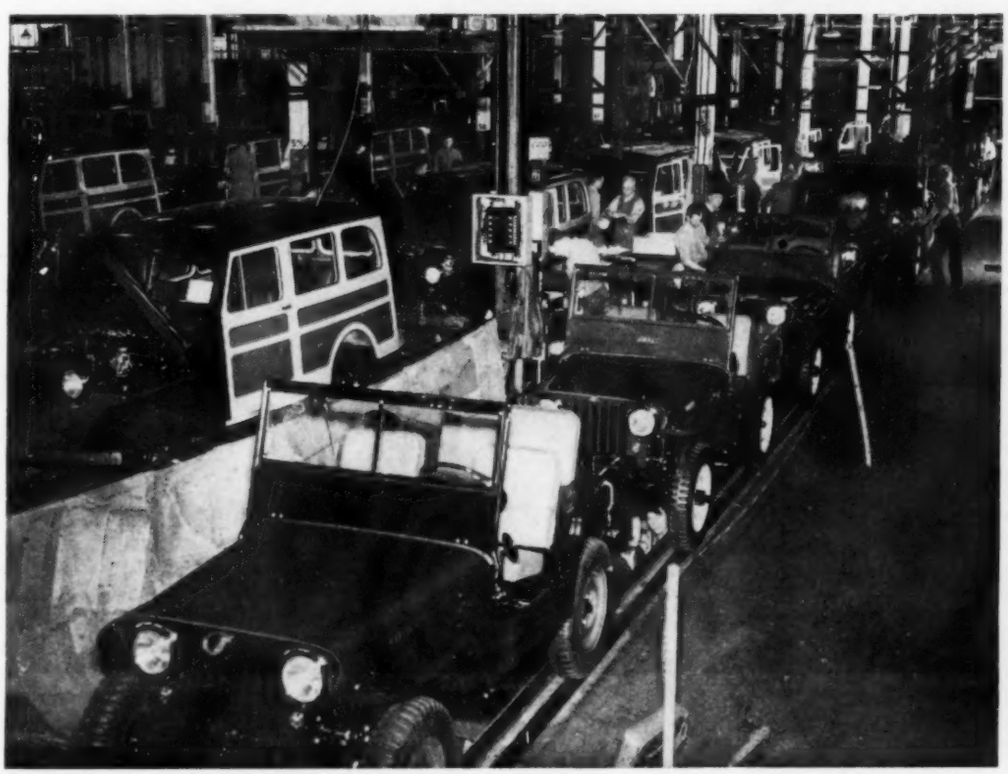
COMING—A DELUXE STATION SEDAN

PLANNED for Spring production is a station sedan, similar to the station wagon, but having a 6-cyl. engine and conventional car interior trim and seats. Dashboard has been brightened with chromium trim also. Front end and front seats are standard, however. The engine fits the standard chassis, takes similar accessories, and will be the power plant for the coming conventional-size car, now in the mockup stage (below)

A MORE CONVENTIONAL SEDAN IS COMING

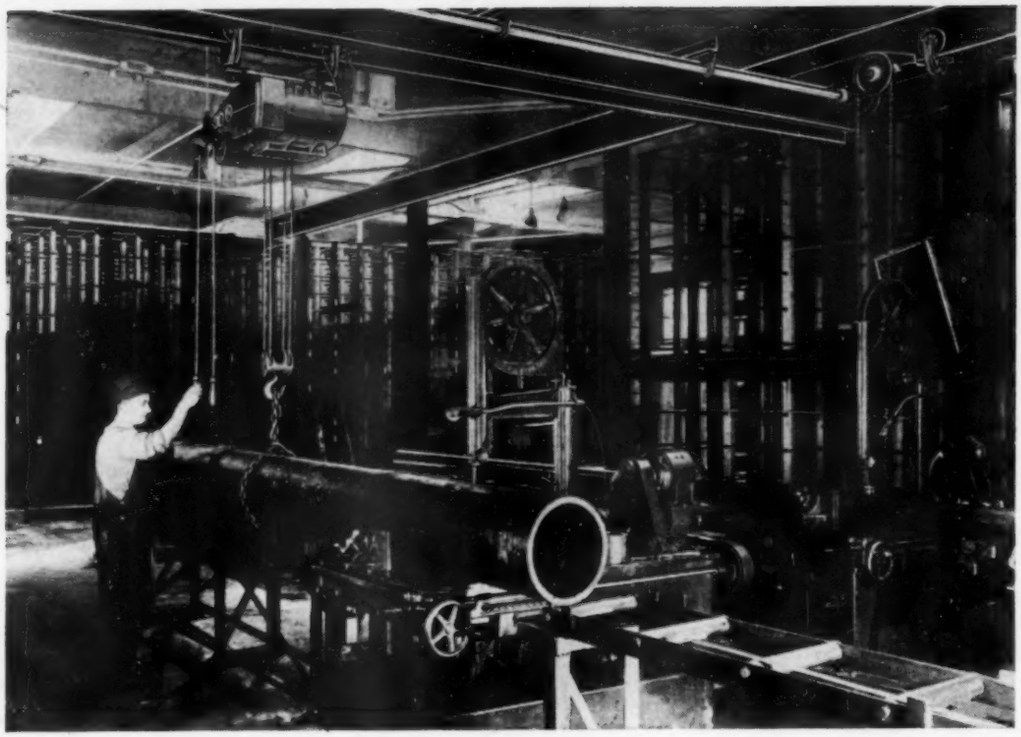
HERE, in mockup, is the 6-71 sedan, planned for production late in 1948. Curb weight will be 2,500 lb., wheelbase 104 in., overall length 180½ in., height 62½ in. The object has been to attain a distinctly "Willys-Overland look," about the front end, and to avoid extreme streamlining. In this way, Willys will avoid the annual restyling race that results in major retooling and line rearrangements and costs difficult for a smaller auto company to absorb. Its 70-hp. power plant will be that now being tooled for the station sedan. Both 2- and 4-door models are planned

TWO FLIGHT CONVEYORS, SIDE BY SIDE, HANDLE NINE TYPES



STATION-WAGON and Jeep lines have both been equipped with flight conveyors, assemblers working in a pit below the vehicles, reducing fatigue and increasing production 25%. No complications are encountered in handling all car types on two lines

American Monorail Co.



OVERHEAD CRANE *carries tube from rack into the chuck of power bandsaw. Tubes are dropped on roller conveyors flanking saw and are then pushed by hand to cutting position*

Handling Spells Economy at Power Saws

Delays caused by saw bottlenecks can often be avoided by planning materials handling to get full production from the power saws

BY BENJAMIN MELNITSKY

POWER SAWS for cutting bar stock to length are actual or potential bottlenecks in most plants because at any given time productive capacity of the saws is relatively stable while production requirements may be extremely variable.

The power-saw department in most plants is considered in the same category as maintenance, stores, and other non-productive departments. Most plant managers hesitate before adding to their plant's fixed costs by procuring new sawing equipment. Plant production planning usually is concerned with maintaining peak loads at lathes, millers, and other production machines—not with peak loads at the saws. Thus production requirements at the saws fluctuate widely between too much and too little work.

An example is 1-in. long steel flanges made from 2-in. square stock. The flanges can be made from 2-ft. lengths of stock delivered to the lathe for cutoff, or the blanks may be sawed 2x2x1⅛ in. at the power saws and then delivered to the lathes for finishing operations. Quite often the production method used will depend on the amount of work at the lathes, *not* at the saws.

When such conditions exist, materials handling may aid in solving power-saw bottlenecks by increasing capacity without adding to the fixed costs of the department. The purchase of a new saw will result in increased production during peak periods; however, during slack periods the new equipment will represent only increased overhead. If, on the other hand, productive capacity of saws can be increased by the use of materials-handling devices, the equipment can be used elsewhere when work at the saws is slack.

Loading Saws

The speed with which it is loaded often determines the production to be obtained from the saw. If after each order the saw operator shuts off his machine, walks to the rack for new bars, carries them to his machine, then resumes sawing, more time is spent in loading and handling than in cutting stock. This system is widely prevalent, and accounts for much of the lack of production. The solution is (1) temporary racks at sawside as a reservoir of bars to be cut, and (2) materials-handling devices to load these racks and to help in transferring stock from them into the saws.

Methods in the power-saw department depend to a great extent on the relationship between saws and the racks where bar stock is stored. If the two are in the same room, parallel to each other, overhead cranes or trolley-mounted hoists can carry bars from the rack across the aisle to the saws. The hoist or crane can load power saws directly. Bars can also be loaded into temporary storage at the saw and when needed

can be transferred into the saw by hand if bars are light, or by hoist or crane when large bars are being handled.

Spindle racks at sawside for temporary storage of bars to be cut are especially advantageous because they permit rapid handling by almost all materials-handling devices. These racks are accessible from front and top; hence, both fork trucks and overhead hoisting equipment can be used. The position of the saws in relation to the racks is also important. Ideally, the relationship should be one in which bars can travel in a straight line from rack into saw chuck, or in a straight line from regular rack to temporary storage, then into the saw.

When the saw department and bar-stock stores are in different buildings or in different parts of the same building, the materials-handling problem is more complicated. Removing bars from racks must still be done by hoisting equipment plus manpower. When bars are out of the rack, they should be placed on dunnage to be picked up by a fork truck or other industrial truck. An alternate system is to load bar stock onto flat wagons or trailers which are then hooked to the back of an industrial truck and towed to the saw department.

Loading a power saw is safer and easier with hoisting equipment than with fork trucks, although the latter can be used. The fork truck's main disadvantage is that it must load from the front of the saw. In order to do this safely, the chuck of the saw must be removed and the saw table cleared to permit rolling bar off forks onto saw. With overhead hoisting equipment, the chuck can be left in position and the bar guided from the side of the saw into the space between the chuck and back plate or over the chuck into position.

Republic Steel Corp.

FLAT WAGONS *to transport cold-rolled bars to saws are loaded by hoist. The cradle on the wagon elevates bars and permits rapid handling at the saw*

A system used successfully in several plants is to share the receiving department's industrial trucks. Thus, at the start of the day before motor truck and rail freight are received, most of the day's saw work is pulled from the regular bar-stock rack and carried by fork truck to the saws for cutting or temporary storage. When required at the saws, trucks can be borrowed for short periods during the day.

Handling Cut Stock

The next phase of materials handling at the power saw has to do with removing sawed-to-length bars from the saw table. In most instances where short lengths are being cut, this can be done by hand; however, where heavy stock is being sawed, materials-handling equipment should be used.

Unit loading used in other phases of plant management is equally as useful at the saws for handling cut stock. By stacking cut bars on pallets or skids, the correct count for each order is easily ascertained and subsequent handling is facilitated. Long bars that do not fit on pallets should be placed on dunnage, either on the floor or on flat wagons.

Exact procedures for handling cut stock depend on several factors. If the machine shop is in the same building and within the path of the crane or hoist servicing the saws, cut bars can be placed in containers for overhead handling. By using various types of grabs, grapples, and hooks, skids and pallets can be hoisted safely from saw directly to machine. Long bars should be bundled with baling wire and hoisted by sling to the machine shop. If, on the other hand, the machine shop is located outside the range of the hoist or crane, the cut material should be prepared for fork truck handling or for delivery on flat wagons.

Perhaps the most economical method is to load long bars on dunnage or flat wagons and short cut-to-length bars on pallets or skids. The latter can be piled and carried on the forks of the truck and the former can be towed by the same truck. If there is a sufficiently large amount of work being sawed, wagons can be loaded according to their destination.

Correct materials-handling procedures at the power saws result in faster movement of materials into and out of the saw department. If, in addition, correct sawing procedures are followed, fewer bottlenecks and greater saw production will result. The procedures to be integrated with materials handling are:

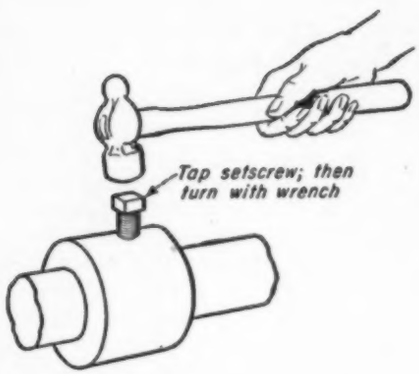
(1) Continuous saw operation should be maintained by so assigning work in the saw and stores departments that the saw operator will not be called upon to shut down his saw and do routine stock work.

(2) Because the saw department is especially vulnerable to accidents, and because an accident will curtail production, safety precautions should be instituted. Operators of industrial trucks and hoisting equipment should be instructed in safe operational methods. When bars are being moved, forks should be tilted back and loads balanced evenly on the forks. Hoist loads should be handled with slings, hooks, and other accessories that are in perfect condition.

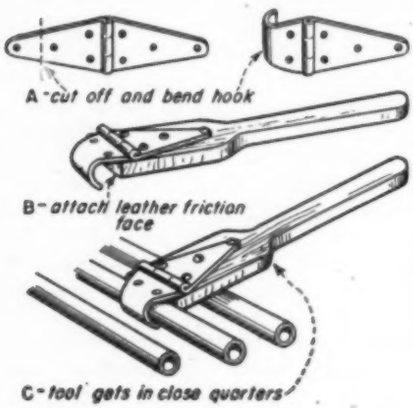
(3) Correct saw feeds and speeds as well as correct selection of saw blades are primary requisites for efficient saw production.

Short Cuts FOR THE SMALL SHOP

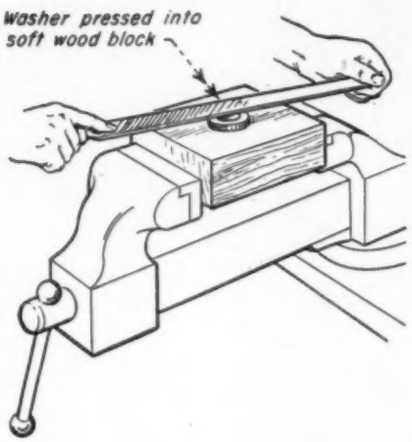
BY A. H. WAYCHOFF



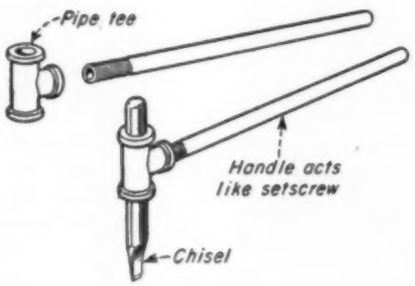
BROKEN SETSCREWS often result from turning them with too much wrench torque in an effort to get a good bite in the shaft. Better practice is to turn the setscrew snug against the shaft, then tap the head with a hammer. Take up a little with the wrench, then tap again. Repeat until a satisfactory bite is obtained. Tapping action takes up the slight slack in the threads, does the major share of embedding the screw point. Thus, the screw head is not overstrained by twisting.



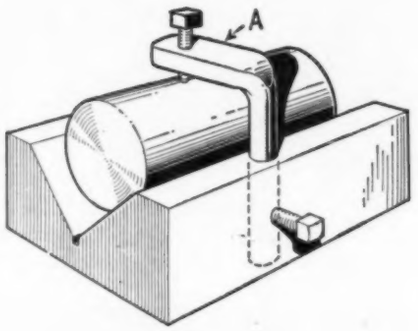
CLOSE-QUARTER wrenches can be made from strap hinges and will serve to tighten tubing or threaded rod connections where a pipe wrench is too large for use. To make a satisfactory tool, cut off one tang of the hinge, as shown at *A*. Curl the cut end to hook shape. Fasten the hinge to a paddle-shaped handle, so that end nearest the hook projects past the hinge pin as at *B*. Attach a leather friction face to the end of the handle. Slip the hooked end around the tube or rod to be tightened as at *C*, bear down on the handle. The leather friction face will bind against the work so that it can be turned.



TO FILE spacing washers to the desired thickness, place them on a soft wood block and embed by squeezing in a vise. Now set the block up in the vise and take cuts with a file until the desired amount of metal has been removed from the washer. Fine wood particles will be picked up by the file, but they can be shaken loose or removed with a fine-wire brush.



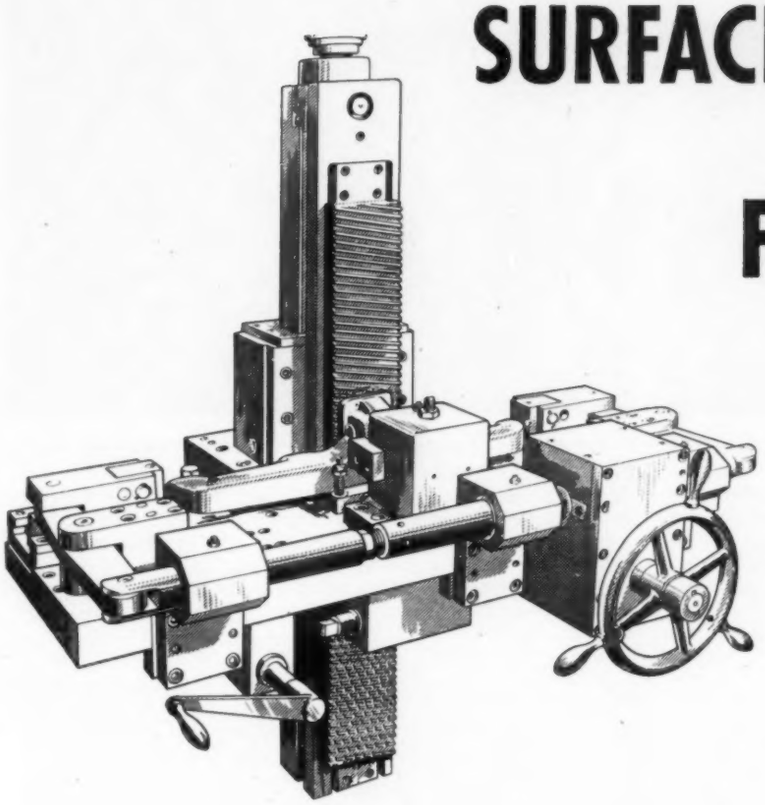
CHISEL HOLDERS will save accidents, especially when the rivet-cutting team is not expert. To make the holder, select a pipe tee that will receive the chisel body, and make a handle from a piece of pipe of suitable length. Set diehead chasers to cut an undersize thread and cut a long thread on the pipe handle. Put the chisel in the tee and screw the pipe handle into the tee until it binds against the chisel like a setscrew. One great advantage of this holder is the fact that the blade can be turned to any desired position to suit the work.



A CLAMPING BRACKET on a V-block is a useful accessory for many operations. Drill a ⅝-in. hole in the top of the V-block to receive the round shank of clamp *A*. Drill and tap a cross-hole in the V-block for a setscrew to set the desired height of the clamp. Drill and tap a setscrew hole in the clamp and assemble to V-block as shown at *B*.

SCOOP PANS are better than shovels for cleaning up chips and dirt about the machine. To make one, cut a 5-gal. can in half lengthwise and attach handles at the ends and one side.

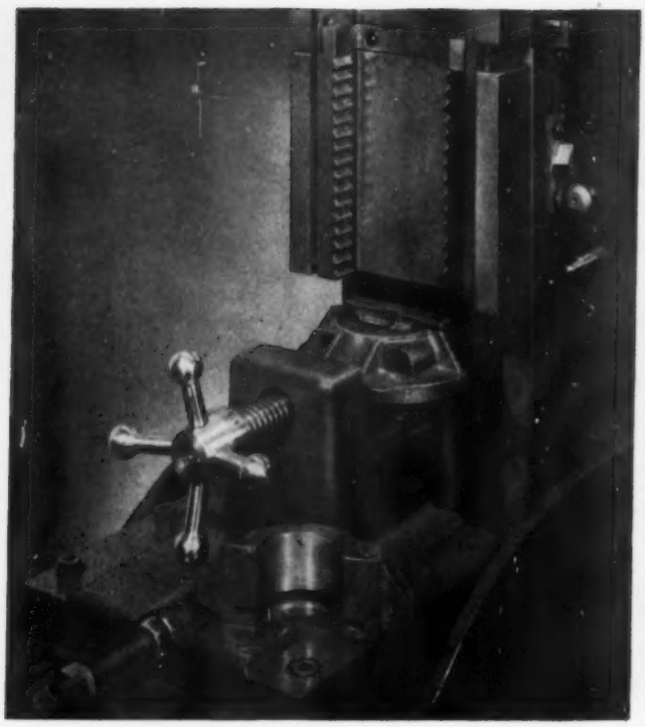
A Handbook of VERTICAL SURFACE-BROACHING FIXTURES . . . I



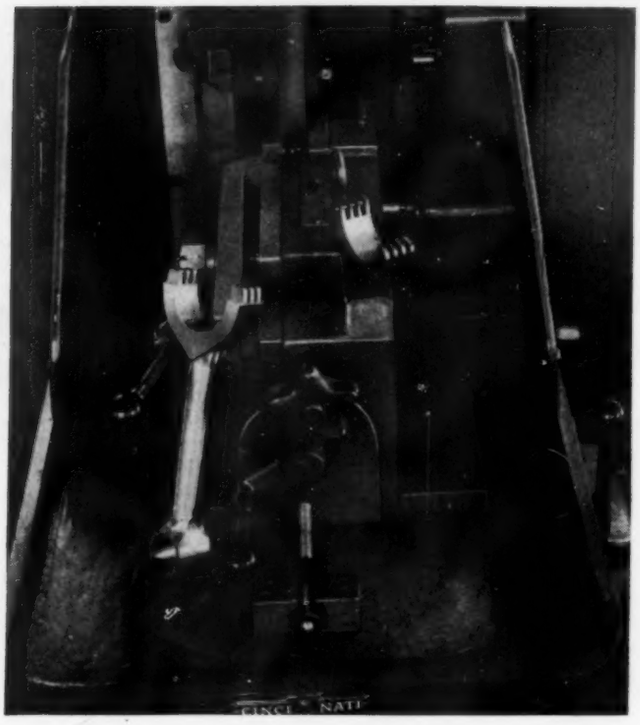
BY BEN C. BROSHEER
ASSOCIATE EDITOR, AMERICAN MACHINIST

Always highly regarded as the only really efficient method of forming relatively small noncircular holes, broaching has achieved new popularity in recent years through the advent of the surface-broaching machine. Metal-removal rates are so high that tool designers have been obliged to employ the utmost ingenuity in providing fixtures which combine sufficient rigidity to withstand the heavy cutting stresses with ease of loading and unloading to avoid impairing the efficiency of the machine. Considered at one time to be suitable only for mass production because of the high cost of tools and equipment, broaching is now being successfully applied to small-lot manufacture through the development of universal fixtures.

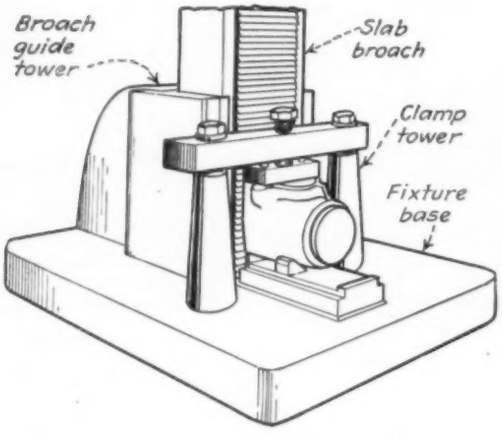
A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES



Lock surfaces on cast-iron bearing caps are finished in this setup on a ½-ton Cincinnati single-ram machine. Stock removal is only 0.002 in., and operation is performed for corrective purposes after caps have been semi-finish broached in other machines. Fixed-table machine is used for high accuracy. Production averages 336 parts per hr. with cutting speed of 28 fpm. Work is clamped with hand-operated screw and unloaded before ram returns



Hand fitting of mating slots in connecting rods and caps for Hispano-Suiza aircraft engines is eliminated by broaching to limits of ±0.0001 in. Machine is a Cincinnati 5/54 single-ram type with fixed table. Hand-clamped fixtures are interchanged for rods and clamps and different sets of broach inserts are used for the two parts. Fixed-type fixture is selected because of high accuracy required. Production is 73 caps or 66 connecting rods per hr.



Guide towers are usually necessary to keep the broach aligned with the workpiece when vertical hydraulic presses are used for surface broaching operations. These towers are often made an integral part of the fixture. Tool shown is designed for surface broaching one end of a small casting

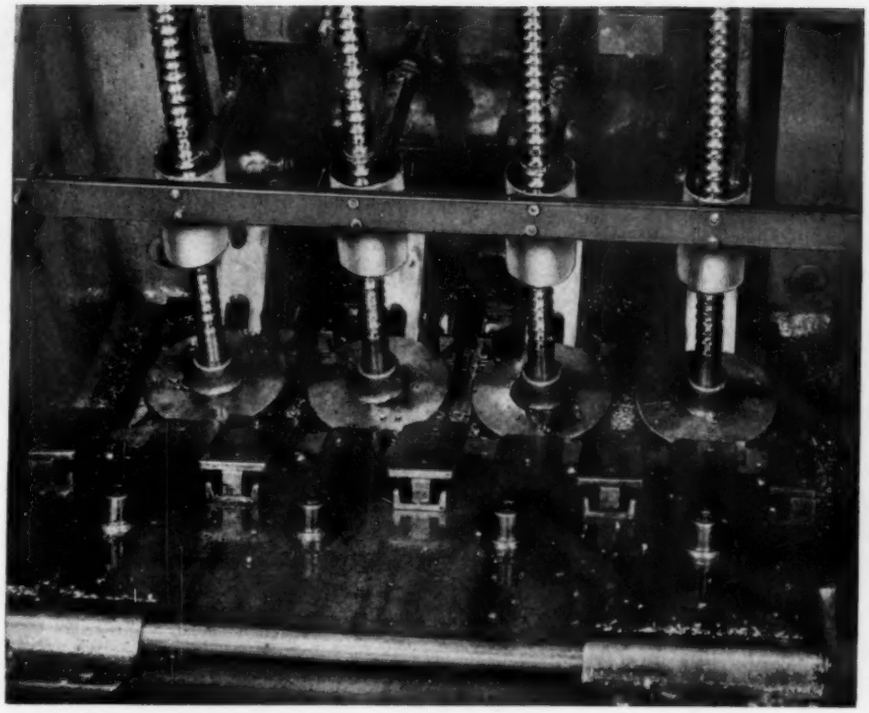
Stationary Fixtures

BROACHING operations today are finding wider application in American metalworking plants than ever before. Production executives who have been studying manufacturing methods in search of every possible economy are finding that broaching offers a number of advantages over more conventional machining methods in cases where part design permits its use, and where production quantities justify the cost of the required broaches and fixtures.

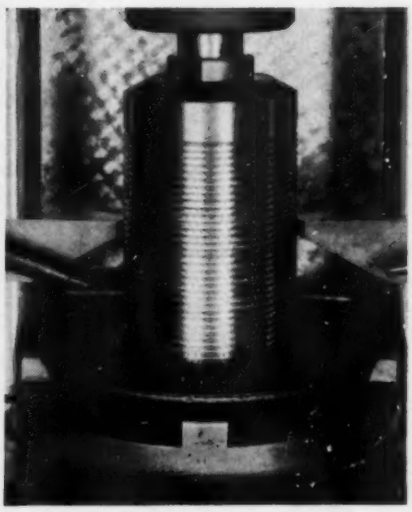
The rapid rise of the process has been due to its ability to remove metal faster than any other comparable machining method, and to the fact that it can produce machined surfaces to high precision and finish. Its application usually is limited to surfaces parallel with the axis of the broach, which have no obstructions in the plane of the broached surface, and where the wall of the part is strong enough to withstand the required broaching thrust, or can be adequately supported.

With tools and fixtures correctly designed for the required operations, interchangeable parts can be machined rapidly from rough forgings or castings, or from previously rough-machined parts. The broaching operation combines both roughing and finishing but no individual broach tooth performs both functions. Each successive tooth removes only a small amount of stock, and is in contact with the work only a short length of time, so broaching cutters properly designed and applied usually produce more parts between resharpenings than is possible with other types of cutting tools.

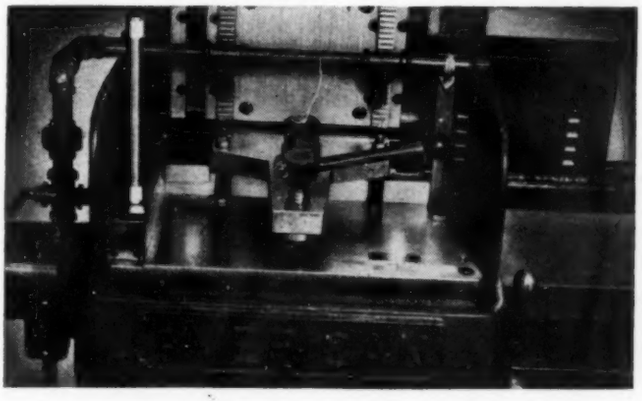
Both horizontal and vertical



Forged steel clutch disk hubs are spline broached on this Oilgear XM-50 Cyclematic machine, four at a time. Material is SAE 1045 and production averages 580 parts per hr. Fixture table moves up to push parts over stationary broaches. When parts have cleared broaches they are ejected from fixture plates and delivered by a chute to a hopper. While parts are in process, four more are loaded on table in front of machine. To load, table is tilted and parts slide onto fixtures. Stop blocks center parts under broaches



Internal surfaces can usually be broached without clamping the part. A facepate type work locator of the type shown on this Colonial 15-ton hydraulic Utility press permits work to float laterally to align itself with the broach shank. Machine has an automatic broach handling device and is used for broaching the bore of a heavy forged steel ring gear. When broach has passed through the work, gear is removed before tool returns to upper position



Automatic loading and ejection is a feature of this magazine-fed fixture on an American T-6-36 Three-Way 6-ton vertical machine for broaching flats at each end of tractor-track linkpins. Part is located on V-blocks and against end locator. At end of stroke, cam on slide trips end stop and operator releases hand clamp. Air cylinder ejects part and operator returns slide to "up" position. Return of ejector rod permits new part to drop into trough while slide is returning. At end of return stroke, slide trips a valve and air cylinder pushes new part against end stop. Hand clamp is tightened and cycle repeated. Production is 300 per hr. at 85% efficiency. Magazine is interchangeable for two different length parts, and broach holder has grooves for either of two pairs of broach inserts

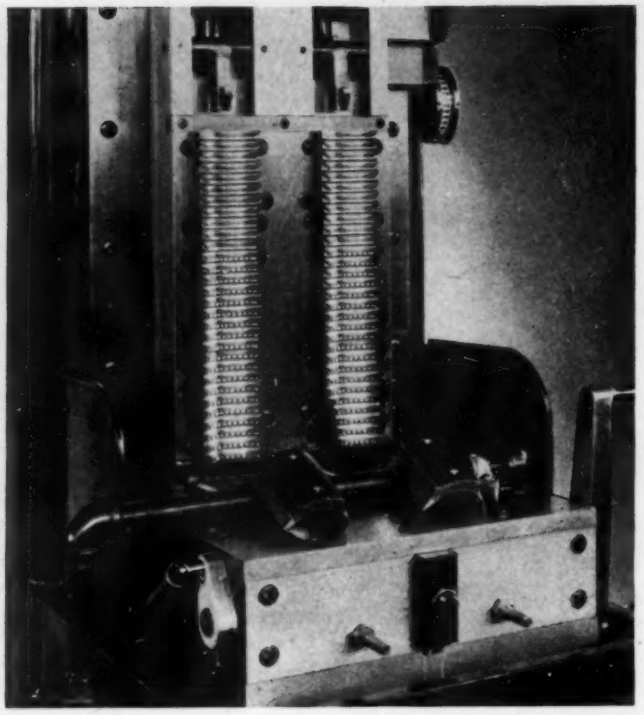
broaching machines are in use. Some are of special design, but the majority are suitable for machining a wide range of different parts within their capacity.

Horizontal machines are especially suited for internal operations in parts where only simple locating fixtures are needed, and frequently such machines have been specially tooled for external operations. But tooling is often easier on vertical machines where clamping of the part is necessary and where automatic withdrawal of the work from the broaching position is desirable to permit return of the broach slide while reloading the fixture. Only vertical broaching operations will be discussed here.

Heretofore, broaching has been considered economical only for operations involving very large quantities of similar parts. But recent developments in fixture design have shown that it is possible to fit vertical machines with relatively inexpensive, easily interchangeable fixtures and holders, and use them for short-run jobs. This is especially true of internal jobs where standard round broaches are often used for a number of different parts—with only minor changes in work locators necessary when changing setups. Users of vertical surface broaching machines are discovering that the same slab cutters can often be used for a wide range of jobs if work-holding fixtures on the machine table are designed for quick interchange.

The flexibility of modern equipment is demonstrated in one plant where a single 15-ton broaching press is equipped with interchange-

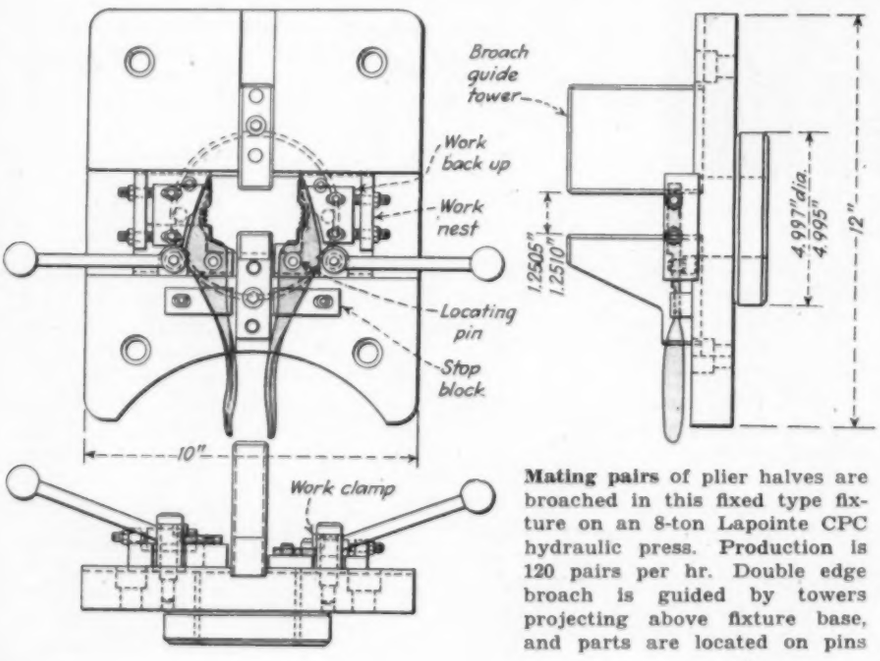
Air operated automatic fixture on fixed table of 5/42 Cincinnati machine holds two generator frames for removing weld flash. Clamp pressure inside parts holds them against fixed locating blocks and automatically starts machine cycle. At end of stroke, clamps unlock and ejector fingers on ram are snapped under parts. As ram reverses, fingers lift parts and tip them on to chuets



Side clamping only is needed when broaching convex surfaces on two forged steel generator pole shoes in this setup on an 8-ton American T-8-24 three-way machine with fixed worktable. Spring-loaded fingers above each broach assembly lift workpieces out of fixture as slide starts return stroke, eliminating manual unloading and danger of damaging broach teeth

able fixtures and broach holders for machining about 60 different parts in lots of 300 to 1000. In this instance, cost of the press and all necessary cutters and fixtures was less than a quarter of what would have been expended if more conventional machines had been selected.

Selection of a broaching machine for a given job, and design of cutters and work-holding fixtures, depend both upon the characteristics of the workpiece and the rate of production required. Operating characteristics of the machine influence the design of fixtures. Length of cut, nature of the material, and size of hole or surface to be broached also are determining factors. So are the depth of cut (step) per tooth, the maximum number of teeth in contact with the work at any given time, and the speed of traverse during the cutting stroke.

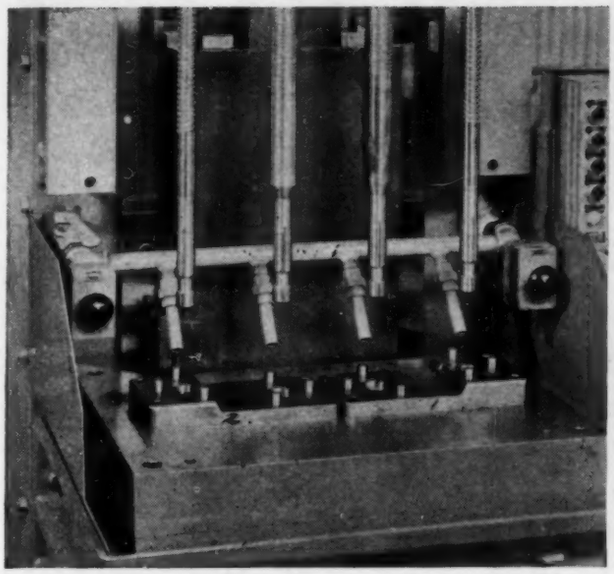


Mating pairs of plier halves are broached in this fixed type fixture on an 8-ton Lapointe CPC hydraulic press. Production is 120 pairs per hr. Double edge broach is guided by towers projecting above fixture base, and parts are located on pins

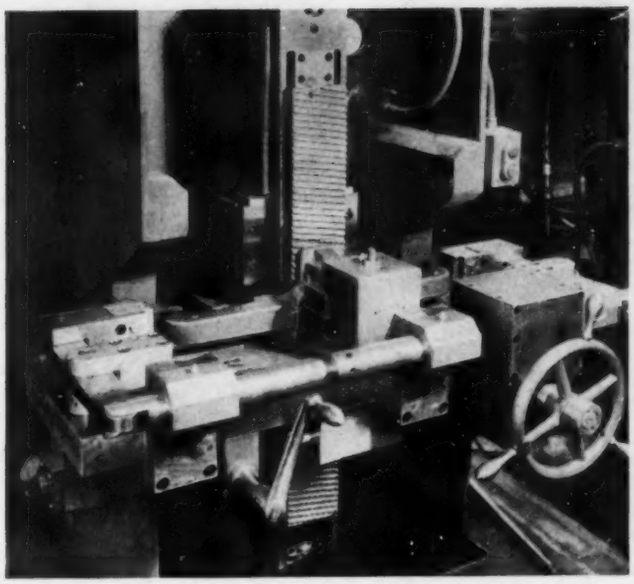
Both internal and surface broaching operations on vertical machines are performed at 12 to 45 fpm. Often small parts are broached at 30 to 40 fpm. or more, and some aluminum parts are being broached at cutting speeds up to 60 fpm. Modern single ram vertical hydraulic broaching machines usually provide infinitely adjustable speeds up to 30-40 fpm., with high slide return speeds. Cutting and return speeds usually are the same on double slide machines, since both slides are driven from a single pump.

Cutting fluids are essential for most operations. Both straight and soluble oils are used, the former generally diluted with paraffin oil or kerosene. Chlorinated and sulphurized oils are sometimes used under heavy cutting conditions. A generous flow of cutting fluid at low pressure is important.

Vibration or chatter during broaching cuts sometimes is traceable to



Two simple fixed locating fixtures on table of an Oilgear XP-30 pulldown machine support right- and left-hand track link side bars for removing about 0.040-in. stock from the diameter of each hole. Operating cycle is semi-automatic to permit operator to remove parts before tools return to upper position. Production averages 135 parts per hr. Dual start buttons oblige operator to use both hands to initiate machine cycle



Exhaust manifold castings are broached in this fixture on a special 15-ton Oilgear PED vertical press. Left-hand lever brings support jack against bottom of casting and also moves in a backup support at center. Handwheel at right operates adjusting screws to bring centering clamp pads against each end of work. Broach guides are provided on the fixture. About ⅛-in. stock is removed at one pass and production is 125 parts per hr.

variations in the number of teeth in contact with the work. Differential tooth spacing—as in groups of two or three—usually will break up this type of vibration. Often change in linear contact with the work by variation in size and spacing of chip breakers will eliminate chatter. Chatter occurs more frequently when broaching holes than in surface broaching, but sometimes shows up when broaching more than one surface at a time, or when broaching several parts at the same time. Designing slab surface broaches for shear cutting with the teeth angled at 5 to 20° eases each tooth into the cut, gives smoother cutting action and helps eliminate vibration.

Fixture Design

Fixture requirements for vertical broaching operations range all the way from simple work locators for internal operations to somewhat complex designs for high-production surface jobs. Because production obtainable is high, fixtures should be arranged for easy loading and unloading. Like fixtures used for other metal-cutting operations, broaching fixtures perform one or all of several functions:

(1) Locate the part in correct position.
(2) Hold or clamp the part so it will not move or deflect.
(3) Guide the broach in relation to the part.
(4) Move the part into and out of cutting position.
(5) Index or infeed the part between cuts.

Fixture design should permit free flow of cutting fluid to the cutting teeth. Adequate chip clearance is essential, and fixture design should eliminate corners or pockets where chips might lodge. When an indexing mechanism is employed, it must not have any backlash which will permit the part to move during the cutting stroke.

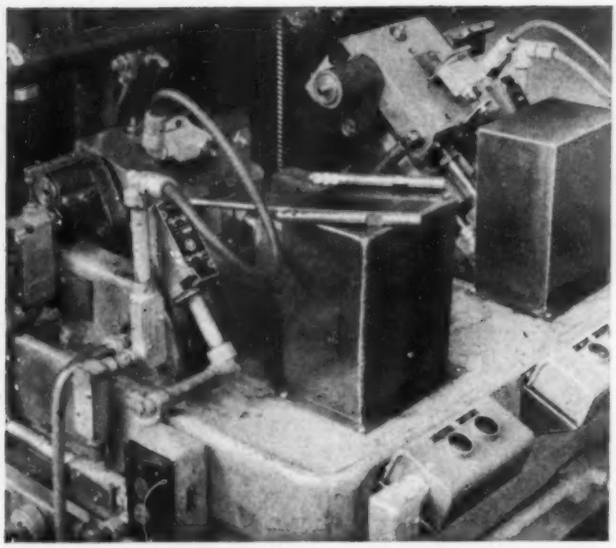
Workholding fixtures for internal broaching usually need not be so elaborate as those required for surface operations. Generally the part is permitted to float laterally in order to position itself centrally on the broach shank. When the hole must be concentric with outside surfaces, it is better to broach first and then finish the other surfaces in relation to the hole.

When surface broaching, the workpiece must be rigidly supported in correct relation to the teeth on the cutter. The fixture must be strong enough to prevent springing under the pressure of the cut, and the clamps must prevent slipping while the cut is in progress. Generally, fundamentals of good design for milling fixtures are applicable when designing surface broaching fixtures, but it must be remembered that the forces encountered usually are greater than when milling. However, the resultant forces developed are of constant magnitude and direction, in contrast to the varying forces developed in comparable milling operations, and consequently clamping is simpler.

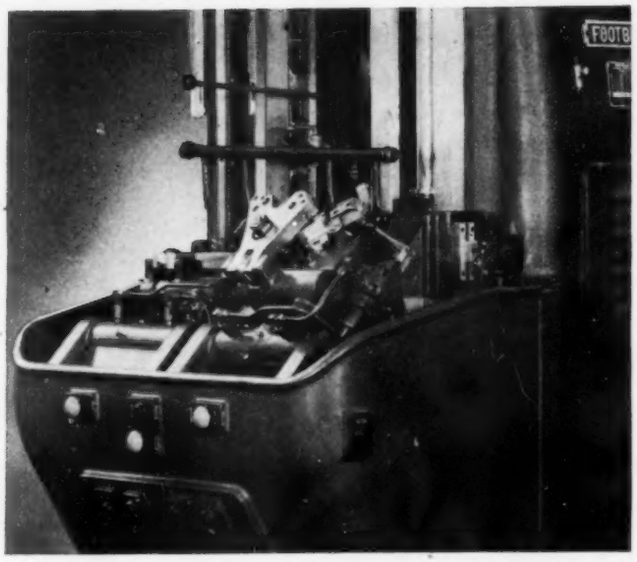
Clamping may be accomplished manually, or with mechanical, air or hydraulic devices. Even high production fixtures are sometimes entirely satisfactory when provided with simple, quick-acting hand clamps. Mechanical clamping arrangements are usually provided on receding table type machines so actuation of the clamps can be automatic, leaving the operator free to take care of unloading and reloading the workpieces. Hydraulic or pneumatic clamping is more expensive and usually is applied only where output requirements are high, or complicated clamping arrangements are necessary.

Equalizing devices sometimes are required to compensate for irregular surfaces of cast or forged parts, and to permit holding the part in correct relation to reference surfaces. Equalizers may be incorporated in the part supports or in the clamps.

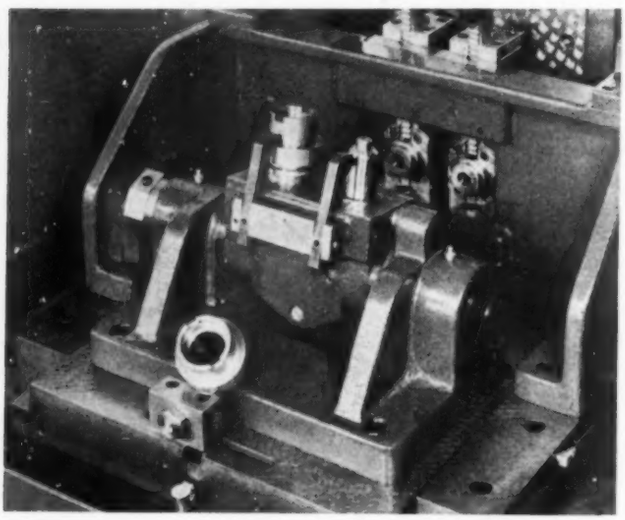
The broach should never be returned to starting position after the cutting stroke has been completed, until the work has been removed from the fixture, or the fixture has



Tip-up fixtures on Lapointe double slide fixed-table machine for broaching notches in shafts. Each fixture holds two parts, and clamps are closed by hydraulic cylinders on tip-up blocks. Parts broached in right-hand fixture are moved to left-hand fixture for second operation. Fixtures are interlocked electrically with machine cycle for safety in continuous operation



Tilting tables, hydraulically operated, are built into a 10-ton double slide Foote-Burt machine. Duplicate fixtures broach pipe wrench handles and movable jaws with adapters for different sizes. 500-psi. cylinders operate clamps by rotating cams. Hydraulic line passes through gland in end of hollow trunnion shaft of tilting table to eliminate flexible connections



Trunnion Fixtures

Steel sleeves to be slotted across one end, central with the bore, are mounted on locating pilots in this tilting fixture on a Colonial single ram, receding table machine. Spring-loaded fingers hold parts while fixture is tilted into broaching position, and pilots on broach guides enter the bore to insure accurate location. Tilting is effected by a cam plate and is interlocked with operation of receding table and movement of broach slide. Broaches are floating and are carried by hardened guides to insure concentricity

been moved so as to withdraw the workpiece from all possible contact with the returning broach. Unless this is done, the high tooth of the broach may strike the edge of the workpiece with almost certain damage to the broach and possible damage to the work, the fixture, and the machine.

Occasionally ejection of the workpiece can be accomplished by lifting it from the fixture with spring-loaded fingers located on the broach slide, directly above the cutter assembly. These fingers slide over the workpiece when the slide moves down, and spring open under the part when the slide reaches the bottom of the stroke. On the return stroke, they lift the part sufficiently to permit it to slide over the fixture onto the machine table.

Fixtures used on vertical broaching machines for both internal and surface broaching operations in general can be classified according to type as:

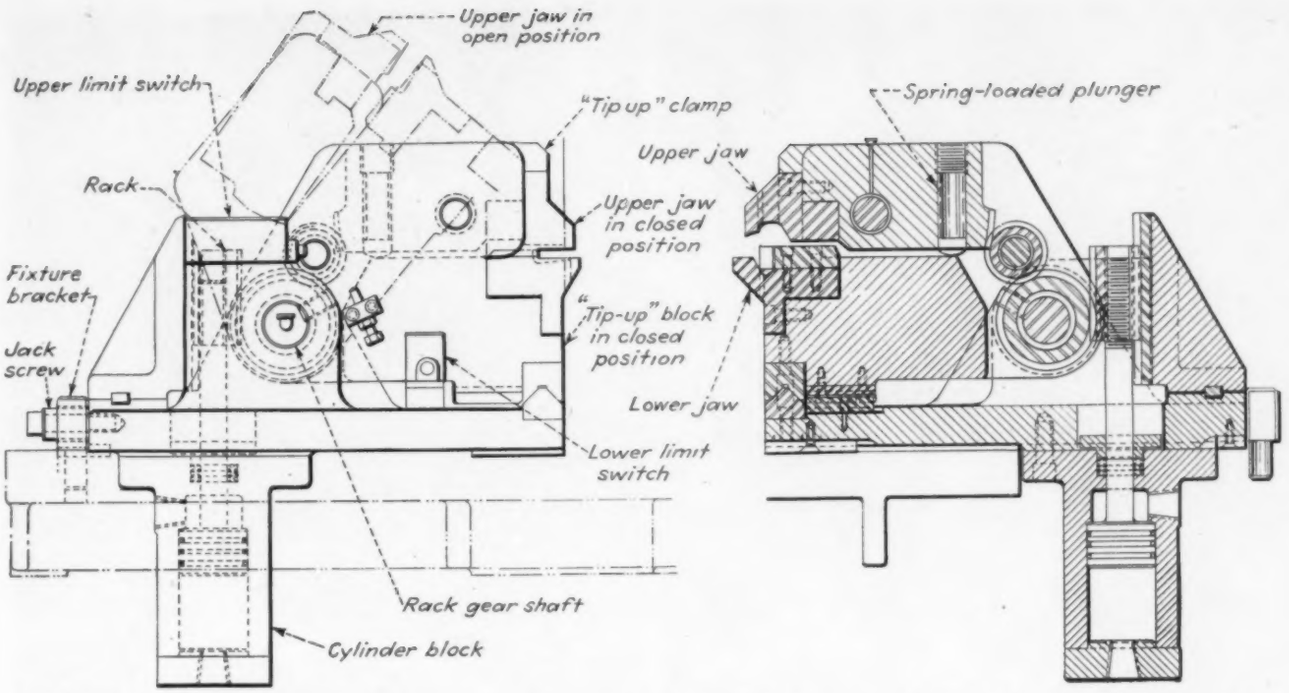
(1) Fixed or stationary type.
(2) Tilting, trunnion or tip-up type.
(3) Indexing type.
(4) Universal or multi-purpose type.
(5) Shuttling, receding, swinging or swiveling type.

They also include fixtures which combine characteristics of several of the basic types listed in the foregoing.

Fixed or stationary type fixtures are those generally employed on stationary table machines of both vertical and horizontal design, and most commonly are used for internal broaching operations. When used for surface broaching on vertical machines, such fixtures often have broach guide towers to hold the broach slide in proper alignment with the workpiece.

Retracting and Tilting Fixtures

Where the surfaces to be finished include a number of irregularities, it is sometimes possible to use a single built-up broach made of simple, easy-to-sharpen sections. Better fin-



Hydraulically operated tilting fixture for broaching handles and jaws of Wescott-type wrenches in six operations on a 15-ton, double slide Lapointe machine. Three operations are done in one fixture and three in another which uses the left-hand slide. Tip-up clamp jaw is normally held closed by spring-loaded plunger and is opened, as the fixture is raised, by means of a rack and gear train. Wrench sizes from 6 to 18 in. can be machined by changing jaws and broach assemblies to suit. Each size requires 16 broach assemblies to perform all the operations

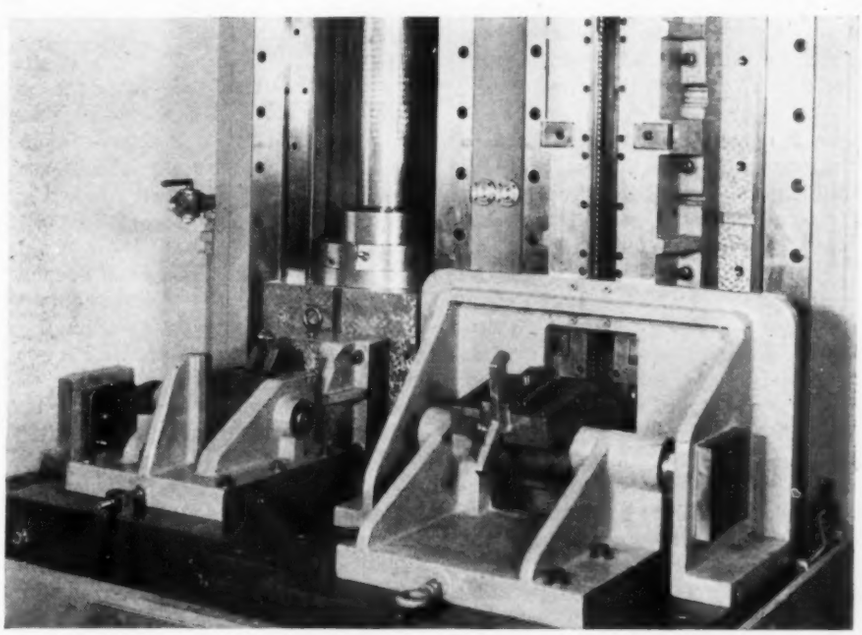
ished parts held to close tolerances, greater output rate and fewer machine hours, are among the advantages claimed when this is done. A major reason probably is the improved support that can be provided for a part in a properly designed fixture.

Surface broaching is usually done in vertical slide machines which operate with a downward cutting stroke. These machines are made in single and dual slide types, and both types are available with fixed or automatic moving work tables.

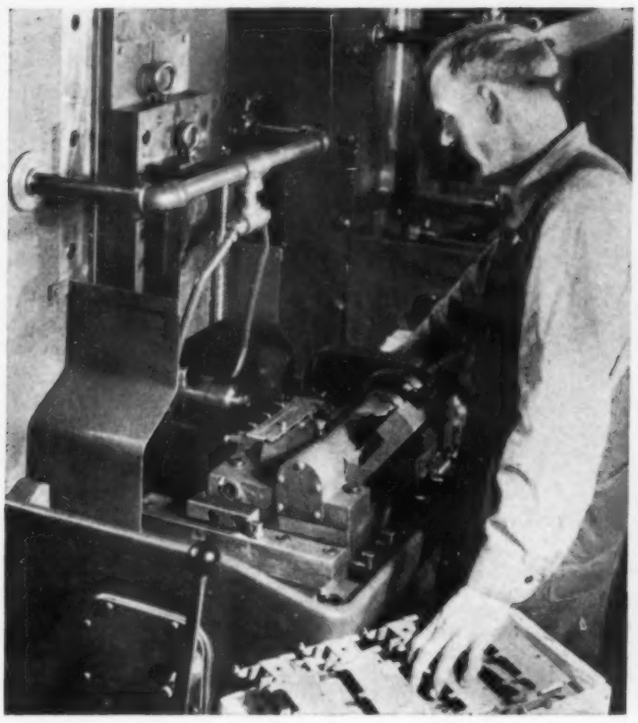
When a vertical surface-broaching machine having a fixed work table is used, operation is similar to that of the fixed fixture for surface broaching in vertical hydraulic presses. Work location points in the fixture are fixed in relation to the broach holder guides and it is necessary to operate the machine on a manual cycle. The workpiece is located in the fixture prior to the start of the broaching stroke, and is removed from the fixture before the start of the return stroke.

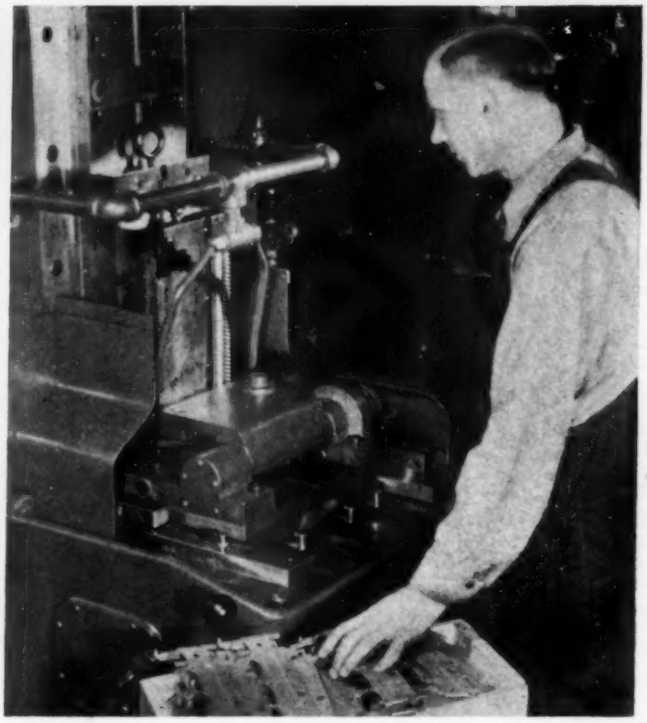
The need for manual-cycle operation on these machines can be eliminated by providing some form of retracting device in the fixture. In most cases, the retracting mechanism is interlocked with the action of the machine slide, so the fixture is automatically retracted from the slide before the return stroke is started and is moved back into the broaching position at the start of the next cycle. When this is not done, it is necessary to rely on the operator's ability to retract the fixture before the slide starts its return stroke.

Most vertical surface broaching machines now incorporate automatic retraction of work tables. In the single slide machine having a moving



Combination of tilting fixture and receding table is shown on this Colonial machine. As table moves back each fixture is tilted by a follower on a crank arm operating in a cam slot in a plate mounted on the table guide bar. In fixtures of this type it is important that a positive lock be provided in the cutting position to insure against any movement while broach is in motion





Clamp arm on this fixture (left) swings wide open for loading and unloading as sliding table on Oilgear XS-6 single slide machine moves back from cutting position. In this position table is 5 in. away from tool so there is no danger to operator. As fixture moves forward (right), rack on machine table turns pinion attached to trunnion shaft and locks clamp down. Parts are 8⅛ in. long and production is 400 per hr. with 1/32 in. stock removal

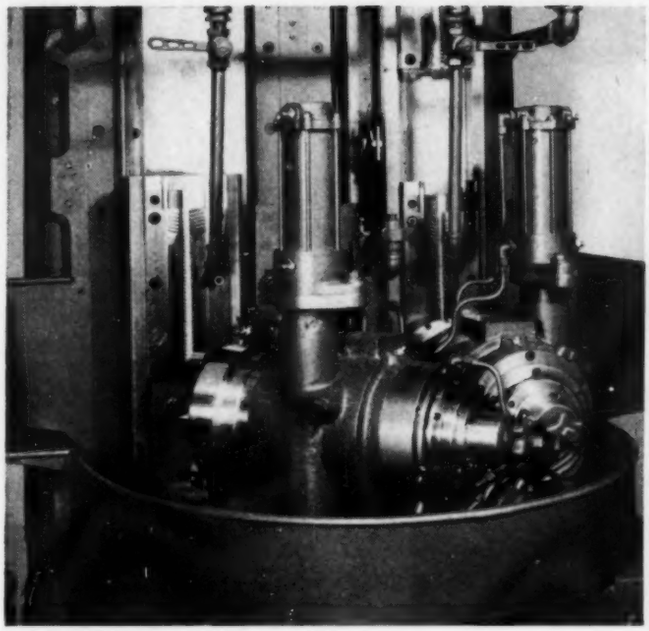
work table, the cycle usually includes the following steps:

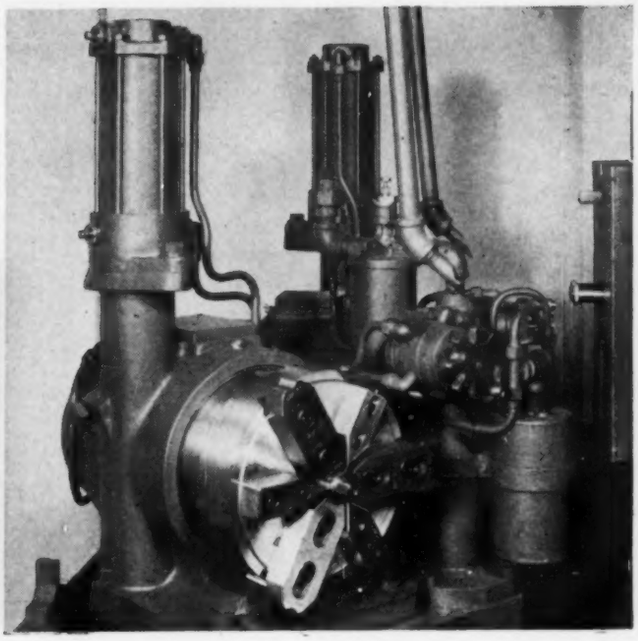
When the workpiece has been positioned and clamped in the fixture, the operator presses dual safety start buttons or operates levers to initiate the semi-automatic broaching cycle. In this cycle the work table automatically moves into broaching position and then the slide moves down for the broaching stroke. At the end of this stroke the work table is automatically retracted 5 to 6 in. (depending on the machine) to loading position and the broach slide is returned to the top of the machine. The operator can start to unload and reload the fixture while the machine slide is moving up. In some cases time for unloading and reloading the fixture is equal to or less than the time required for the return stroke of the slide, and the machine can be operated on the equivalent of an automatic cycle. However, safety for the operator is insured by interlocking the electric controls so the machine cycle will not repeat at the end of the return stroke until the operator has pressed two safety start buttons or moved a control lever.

For some operations, a single-dual surface broaching machine has advantages. In this machine, two broach assemblies are mounted on a 90° adapter bolted to the single vertical slide. Two receding-type work tables are used, one opposite each of the 90° faces of the adapter. The operator loads a workpiece into one of the fixtures and then moves a control lever to initiate the machine cycle. He then moves over to the second work table and reloads its fixture. Meanwhile, the first work table unit automatically moves into broaching position and the machine slide starts down for the broaching stroke. At the end of the down stroke, the first work table unit returns to the loading position and the machine slide moves up. If the fixtures have been designed for rapid handling of workpieces, the second worktable is ready for movement into the broaching position when the cycle for the first table has been completed.

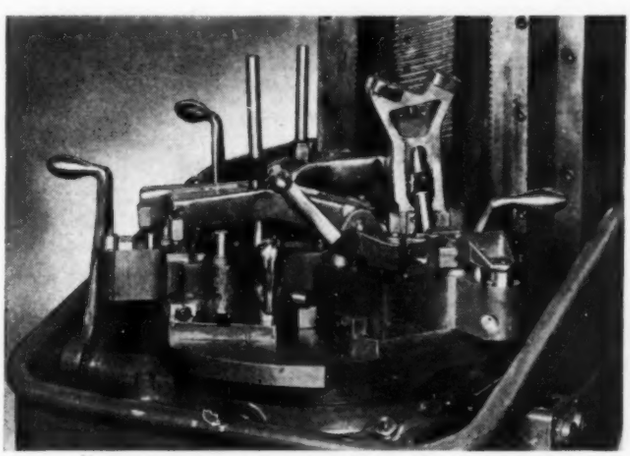
Dual-slide surface-broaching machines actually are two single-slide machines built into the same frame, and arranged so the slides move down and up alternately. Ram speed is the same in both directions. Fixtures are mounted on worktables of several types which automatically withdraw the work from broaching position during the return stroke of the slide, and broach-and-holder assemblies are carried on the two vertical slides. This type of machine is best adapted to operations where the fixtures on one table can be unloaded and reloaded while parts held on the other table are being broached, and there is no need for delay in starting the second cycle. Provision sometimes is made for protection of the operator by interlocking controls, thus making it impossible to start a second cycle until the operator has pressed control buttons or moved start levers controlling the second station.

A relatively recent development in interlocking safety controls for vertical surface broaching machines is the Pre-Set Cycle Control system originated by Cincinnati Milling Machine Co. In this system pushbutton stations are located on each side of each slide. When the operator has completed the reloading operation in a fixture he depresses simultaneously the buttons flanking the slide in front of the fixture. The operator must use both hands, assuring his safety. If the slide is moving up when the buttons are depressed, it will start a cutting stroke immediately after the end of the return stroke. Or, if the return stroke is finished when the buttons are depressed, a new cutting cycle is initiated. Continuous cycle operation can thus be obtained at the option of the operator if his loading duties have been completed and he pre-sets the cycle by depressing both buttons.





Split-stroke pneumatic fixture for broaching square ends on socket wrenches on swinging table of a Cincinnati 3/48 vertical duplex Hydro-Broach. When 8-in. space between broach inserts passes work, air cylinder indexes chuck 90° within 0.7 sec. when ram is moving at 44 fpm. Indexing is tied in with ram movement by a dog on the ram engaging star wheel on fixture. Safety interlock stops ram if fixture fails to index properly. Duplicate fixtures (left) are mounted at two table positions and are turned alternately into cutting position, one being loaded while the other is in use. Interchangeable jaws (right) accommodate 17 different sizes and lengths of work. Production is 578 pieces per hr. in continuous cycle with one fixture being unloaded while other is working



Index Fixtures

Rotary hand-indexed fixture on shuttle table of Foote-Burt 10-ton, single slide, 54-in. stroke machine holds three different parts. Each of three sub-fixtures on index table is spaced so part will align with two of three broaches on slide. This saves banking of parts, provides constant flow of all three parts, and makes use of a single machine when production requirements do not justify purchase of three machines. Production averages 200 pieces per hr.

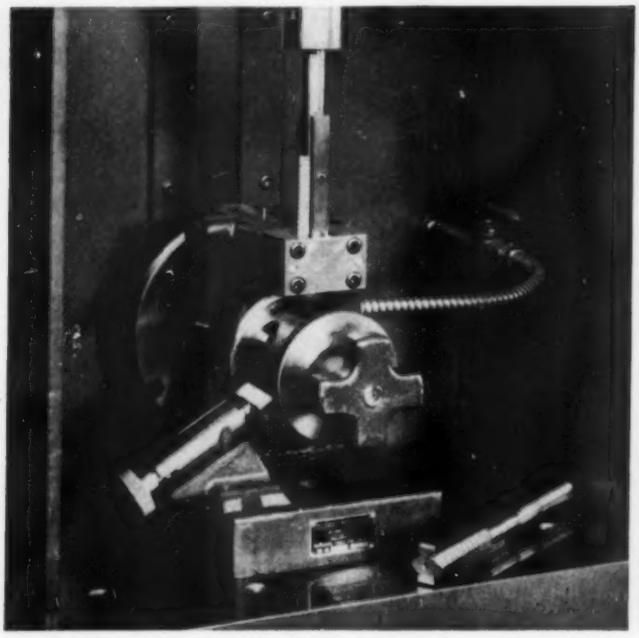
Where fixed tables are used on vertical machines, a popular method for providing retraction of the workpieces from the broaching zone prior to return of the broach slide is to use tilting fixtures, sometimes known as trunnion or tip-up fixtures. These are usually arranged for automatic tilting in a machine cycle incorporating mechanical, electric or hydraulic interlocking of the fixture tilting mechanism with the operation of the slide. This arrangement insures against damage to the broaches, the fixture or the workpieces during the return of the tool.

Trunnion or tip-up fixtures are also used on vertical surface broaching machines equipped with receding tables. In these cases, they serve to bring the workpieces up and further away from the broach slide, and so provide more room for the operator when unloading and reloading the fixture. This is especially advantageous when parts of some length must be loaded longitudinally into the fixture to permit operations on one end.

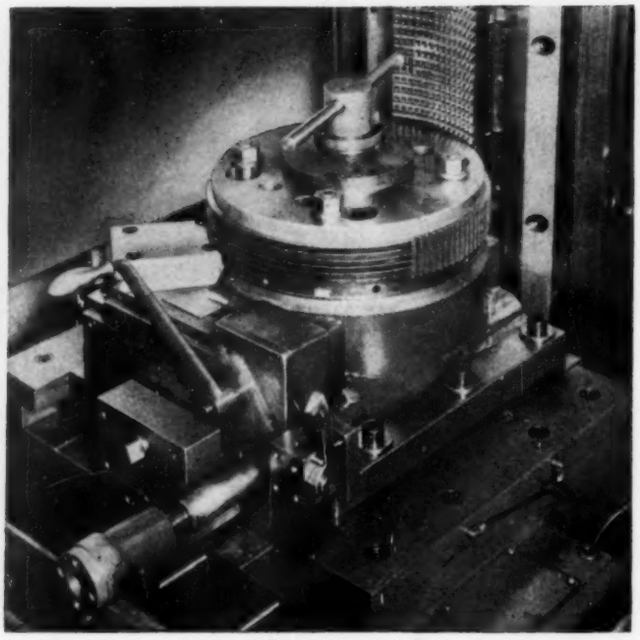
Indexing Fixtures

As when indexing fixtures are employed for other machining operations where precise dimensions must be held, indexing fixtures designed for broaching operations must be carefully constructed to resist forces applied by the cutters. Design of indexing fixtures must be such that there is no backlash to permit movement of the part during passage of the broaches. This applies particularly to continuous high-production operations where extreme accuracy is required. Usually, over-size index lock pins are employed. Precision workmanship is essential in fixtures which index parts between successive broaching passes.

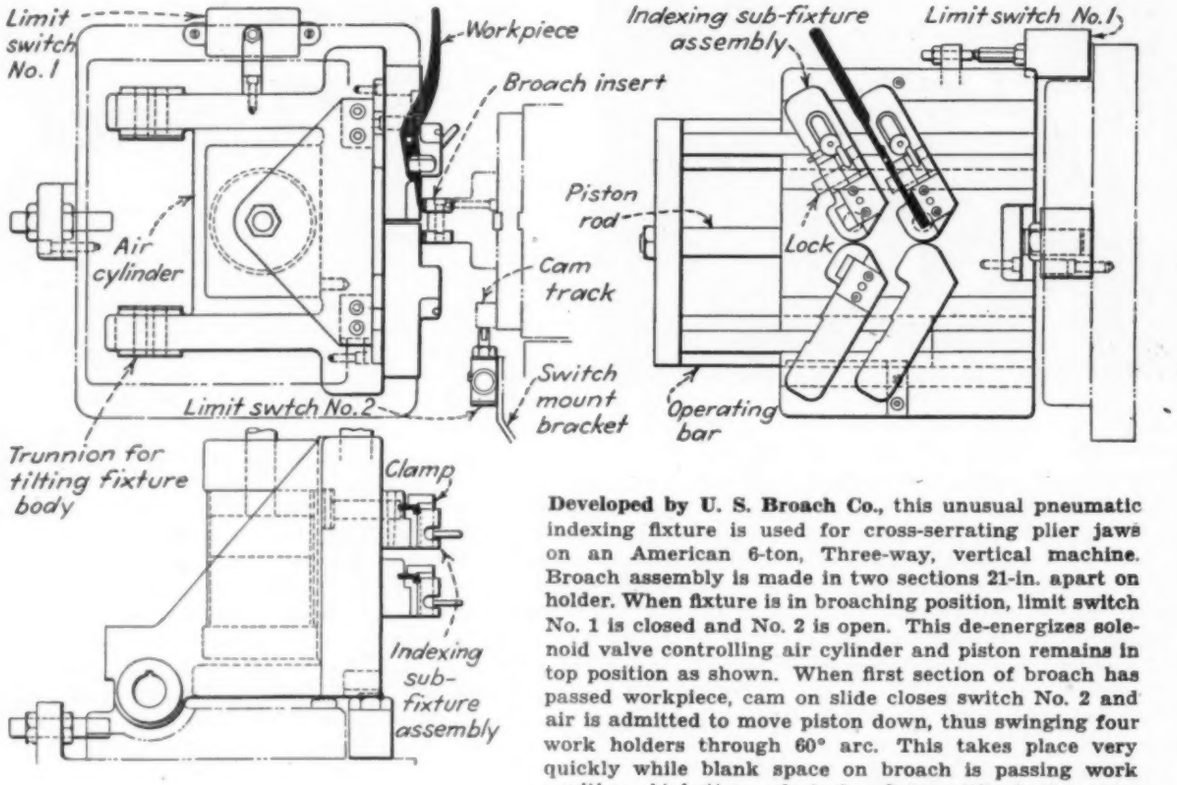
Most indexing fixtures are interlocked electrically with the machine to insure against movement of the broaches unless the fixture is indexed and locked in proper position.



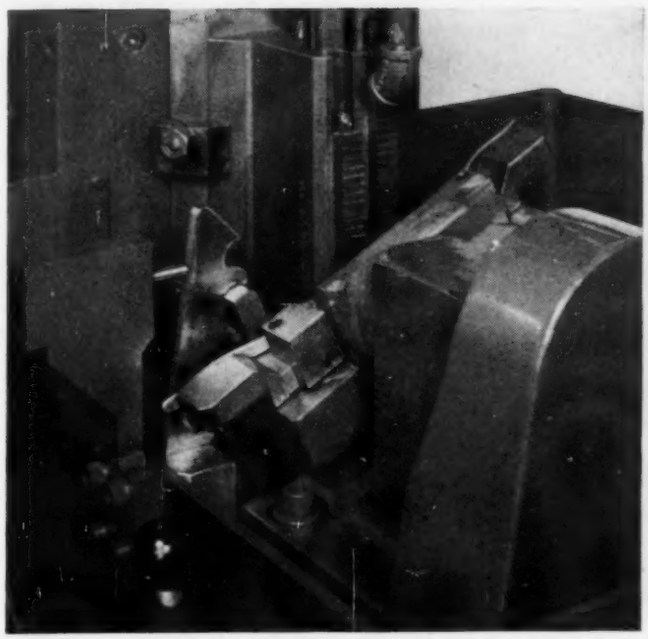
Opposed grooves are broached in sides of three slots milled in periphery of steel synchronizer housings at 100 per hr. in this fixture made by Colonial Broach Co. Mounted on an Oilgear 10-ton press, hand indexed fixture has guide to align broach with work. Locator on left side of fixture locks part against rotation during operation

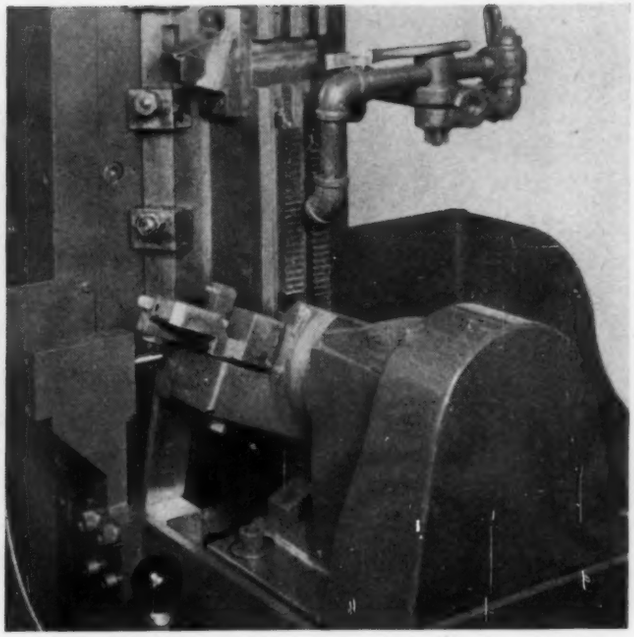


Ratchet type indexing fixture mounted on receding table of a Colonial single ram machine for broaching external teeth on automobile starter ring gears. Six blanks are clamped in fixture and 110 teeth are cut around periphery during complete cycle. At end of each of eight cutting strokes in cycle, fixture indexes while table moves back



Developed by U. S. Broach Co., this unusual pneumatic indexing fixture is used for cross-serrating plier jaws on an American 6-ton, Three-way, vertical machine. Broach assembly is made in two sections 21-in. apart on holder. When fixture is in broaching position, limit switch No. 1 is closed and No. 2 is open. This de-energizes solenoid valve controlling air cylinder and piston remains in top position as shown. When first section of broach has passed workpiece, cam on slide closes switch No. 2 and air is admitted to move piston down, thus swinging four work holders through 60° arc. This takes place very quickly while blank space on broach is passing work position. At bottom of stroke, fixture tilts back, opens switch No. 1 and returns cylinder to original position. Returning ram to top position opens switch No. 2, and tilting fixture to broaching position closes switch No. 1





Angular serrations are broached on plier jaw faces with this automatically indexed fixture on a Cincinnati 1/30 single ram vertical machine. Two parts are clamped in fixture for each broaching cycle. Serrations are broached in one direction with lower pair of broach inserts with fixture tilted as shown at left. Then, fixture is automatically tilted to other side (right) and second pair of inserts cuts serrations in the other direction. After parts are unloaded, ram is returned and fixture indexes back to first position. Production averages 463 pieces per hr.

In most cases this is accomplished by using precision limit switches incorporated as integral units in the fixture assembly.

Indexing fixtures in many cases make possible continuous cycle operation of single-slide broaching machines, because fixture stations can be unloaded and reloaded while parts held in another station are being broached. Therefore, in most cases, hand clamping is fast enough, and more expensive mechanical, air or hydraulic clamping arrangements are not necessary. Indexing fixtures for most internal broaching operations do not require workholding clamps because the broaching pressure is sufficient to hold the workpieces in position.

Because means must be provided for rotating the indexing fixture, the designer must pay careful attention to the direction and amount of the broaching forces which must be resisted by the fixture without distortion or vibration. The fixture designer must provide a solid support as close as possible under the broaching cut, in order to absorb direct thrust, as well as rigid lateral support wherever there is any possibility of deflection because of lack of rigidity in the workpiece. When clamping is necessary, clamping pressure should be as nearly as possible in the direction of direct broach thrust and as close to the surface being broached as possible. Where the part extends some distance back of the broaching cut, additional clamping sometimes is necessary to insure against vibration of the part. All clamping loads should be resisted by pads on the opposite side of the workpiece. Where rough cast or forged parts are to be broached, these pads can be adjustable jacks brought against the surface of the part automatically or manually after the part is located in the fixture.

Universal Fixtures

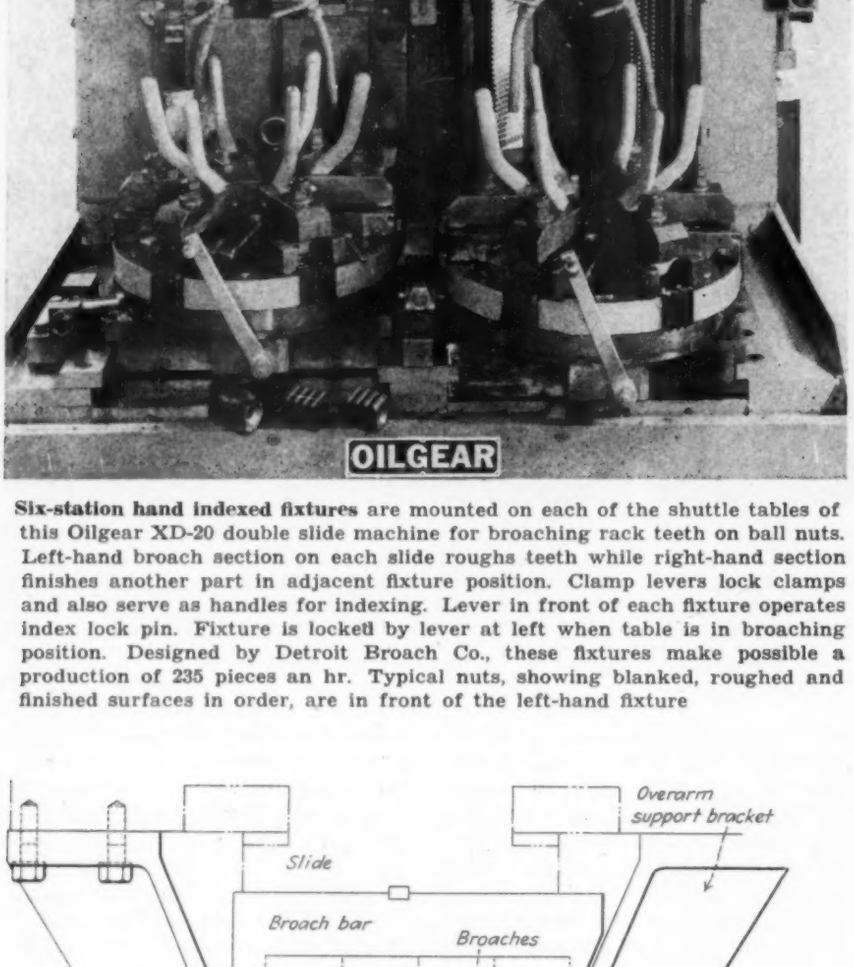
Probably the most important recent development in the field of surface broaching has been the application of universal or multi-purpose fixtures which make it possible to achieve the low-cost benefits of surface broaching on relatively short-run jobs. This has made possible the application of the surface broaching process to parts where job-lot quantities heretofore have not been sufficient to justify the cost of the necessary fixtures. This is especially true of slab broaching operations where the same broach can be used for a number of jobs.

In some cases only locators and clamps are changed in the adjustable fixture assembly to permit broaching several sizes of the same type of part. In other cases, whole fixture subassemblies are changed on fixture bases. The designer should give particular attention to ease of changing fixtures and broach holders in such cases. In surface broaching operations of this type, fixture cost must be held at a minimum while retaining all of the necessary features of rigidity and accuracy. The success or failure of many job-lot operations depends entirely on the ingenuity of the designer.

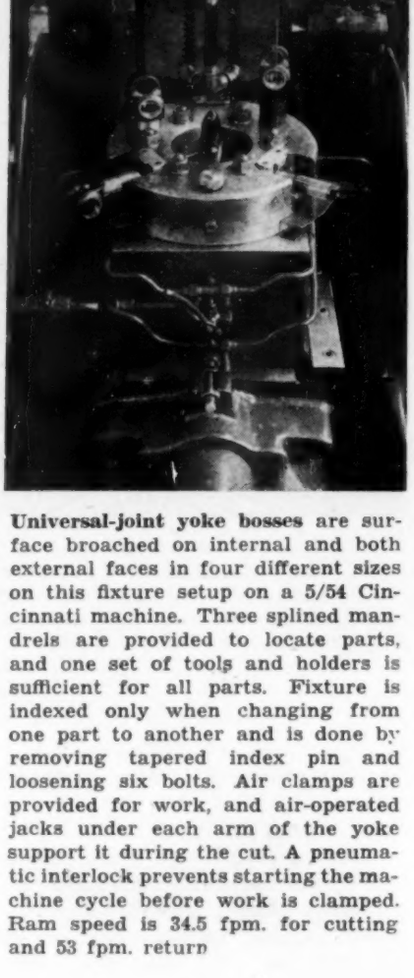
Future Application

In the future many parts made in relatively small lot quantities will be surface-broached when the manufacturing quantities are reordered often enough to justify relatively low cost universal fixtures. In this regard, most universal slab broaching fixtures are cheaper in terms of tool and setup cost per piece than many non-fixture machining setups on other machine tools. As universal fixtures are developed which make changes in setup easier and less expensive, it is safe to say that the surface broaching process will be given first consideration in many plants where close machining tolerances must be held and better surface finishes are required.

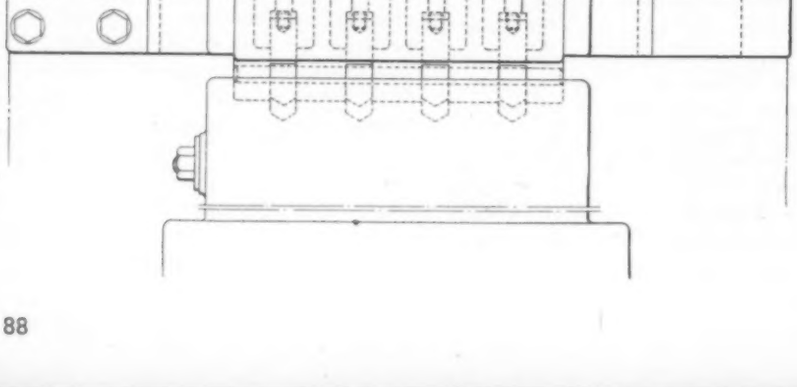
Part II of this report will appear in a subsequent issue—*Editor.*



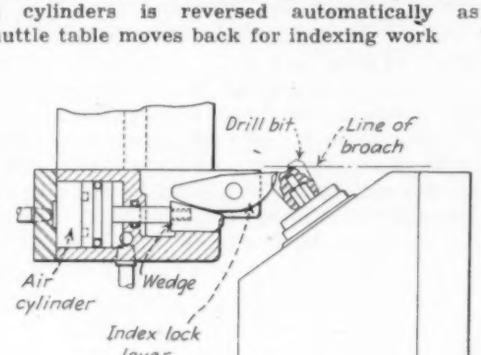
Six-station hand indexed fixtures are mounted on each of the shuttle tables of this Oilgear XD-20 double slide machine for broaching rack teeth on ball nuts. Left-hand broach section on each slide roughs teeth while right-hand section finishes another part in adjacent fixture position. Clamp levers lock clamps and also serve as handles for indexing. Lever in front of each fixture operates index lock pin. Fixture is locked by lever at left when table is in broaching position. Designed by Detroit Broach Co., these fixtures make possible a production of 235 pieces an hr. Typical nuts, showing blanked, roughed and finished surfaces in order, are in front of the left-hand fixture

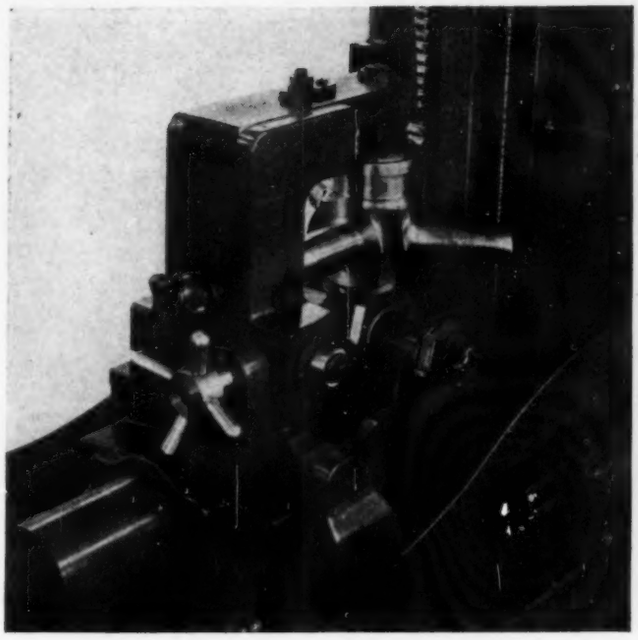


Universal-joint yoke bosses are surface broached on internal and both external faces in four different sizes on this fixture setup on a 5/54 Cincinnati machine. Three splined mandrels are provided to locate parts, and one set of tools and holders is sufficient for all parts. Fixture is indexed only when changing from one part to another and is done by removing tapered index pin and loosening six bolts. Air clamps are provided for work, and air-operated jacks under each arm of the yoke support it during the cut. A pneumatic interlock prevents starting the machine cycle before work is clamped. Ram speed is 34.5 fpm. for cutting and 53 fpm. return

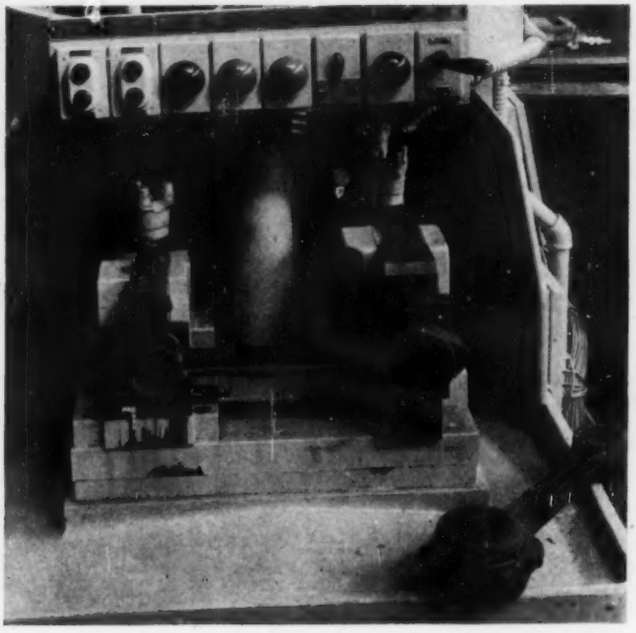


Principal details of four-spindle indexing fixture for sharpening rock drill bits. Individual air cylinders in overarm above shuttle table move wedges to lock four workpieces in position throughout each broaching stroke. Air pressure in cylinders is reversed automatically as shuttle table moves back for indexing work

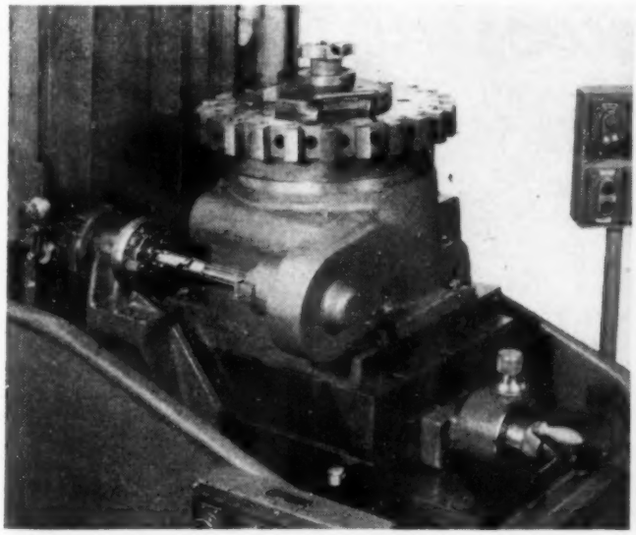




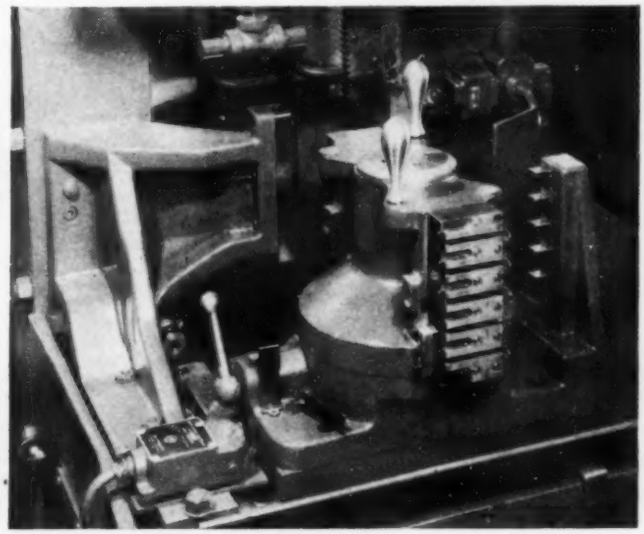
Six cuts are required to broach slots 1.250 in. wide and 0.672 in. deep in aircraft propeller hub spiders on a 5/54 Cincinnati single-ram machine. Between successive cuts fixture is advanced manually 0.112 in., a six-position cam, automatically indexed by the return movement of the table, controlling this depth of cut. After sixth cut, fixture upper slide is reset so roller again contacts highest cam lobe. To prevent automatic indexing of cam before top slide has been moved back, sixth ratchet tooth is omitted. When slot is cut to depth, work is indexed manually to next slot. Ram speed is 20.7 fpm because of toughness and hardness of material



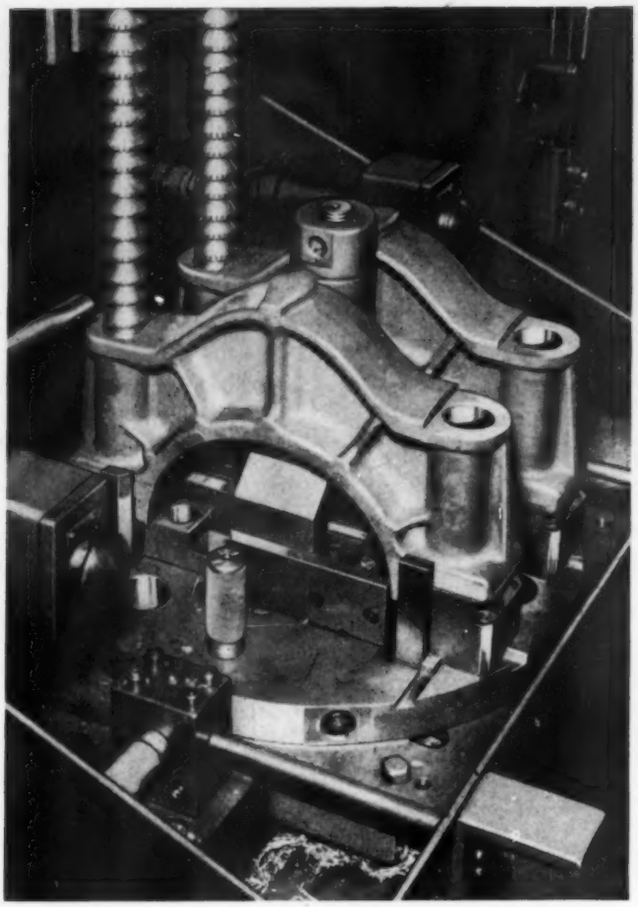
Both sides of connecting rod bosses are surface broached on this index fixture on a Cincinnati 15/60 single-ram Hydro-Broach. Table indexes 90° upon completion of downstroke. Side of table then presented to ram is short enough to clear tools while ram returns. As ram reaches top, table again indexes 90° to bring opposite side of fixture into position for second cut. Idle side is unloaded and reloaded while opposite side is being broached. Three rows of inserts are mounted on holder for two sizes of rods, and clamps for small end of rod are shifted to another position when smaller rod is to be broached. Output is 42 per hr. at 33-fpm. cutting and 66-fpm. return

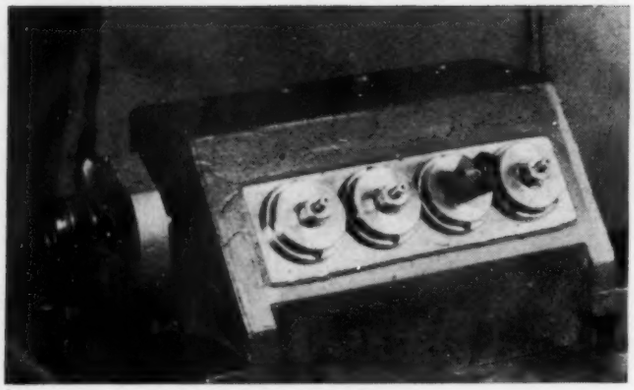


Blade slots in milling cutter bodies from 6½ to 18 in. in dia. and from 1 to 1½ in. thick are finished on this automatic indexing fixture on a 10-ton Foote-Burt machine. Cutter bodies have from 12 to 44 slots, 1 to 1¼ in. wide and ⅞ in. deep, and are rough milled to leave 1/16-in. stock for broaching. When helical slots are required, fixture is tilted on receding machine table, a universal joint being provided in star-wheel index drive to permit this. Pick-off gears in index drive gear train permit use of four-point star wheel for all indexing. For most jobs, each slot requires about 15 sec. for complete broach and index cycle of the machine



End radius and inside face of nickel steel pole pieces are broached at 1200 per hr. on an Oilgear XS-6 single slide machine in this manually indexed fixture. Stock removal is 1/32 in., and limits are held to ±0.0005 in. Two-station fixture is mounted on shuttle table and has positive mechanical interlock and precision limit switches to insure accurate location before slide can move down. When fixture is precisely located, limit switch starts machine cycle. As fixture is indexed, five finished parts are automatically ejected by blades set in vertical tower at right of base. These sweep parts into chute leading to basket conveniently located beside machine table

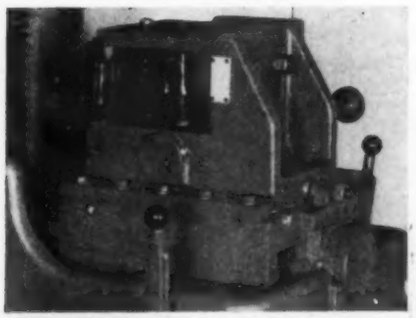


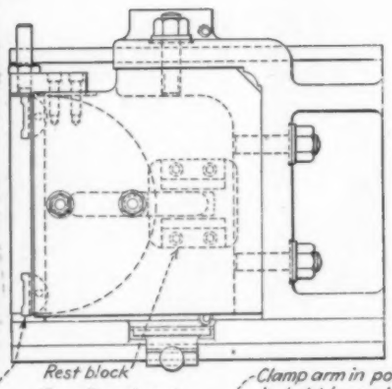


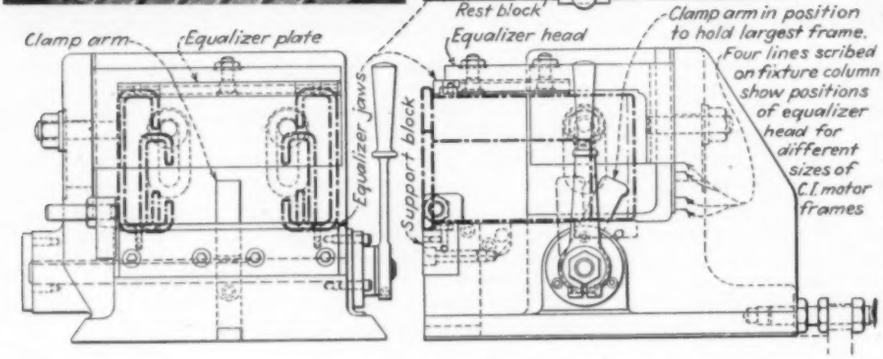
Forged-steel rock-drill bits are sharpened four at a time in this automatic indexing fixture developed by Detroit Broach Co. for an XS-12 Oilgear single slide machine with shuttle table. Production averages 275 bits per hr. About 1/32-in. stock is removed from surfaces between teeth in four broaching passes. At end of fourth stroke, table automatically moves back for unloading and reloading

Manually indexed, this fixture is used in broaching bolt holes in forged steel bearing caps at 53 per hr. on an Oilgear XP-20 vertical pulldown machine. Two 1 1/16 or 1 9/16-in. holes are rough and finish broached in each of two caps per cycle. About 0.033 in. stock is removed from each hole. Developed by Detroit Broach Co., fixture has clearance holes in index plate to permit broaches to return after partial index at end of down stroke. Fixture positions are interlocked to prevent movement of broach slide unless accurately located *Courtesy Fairbanks, Morse & Co.*

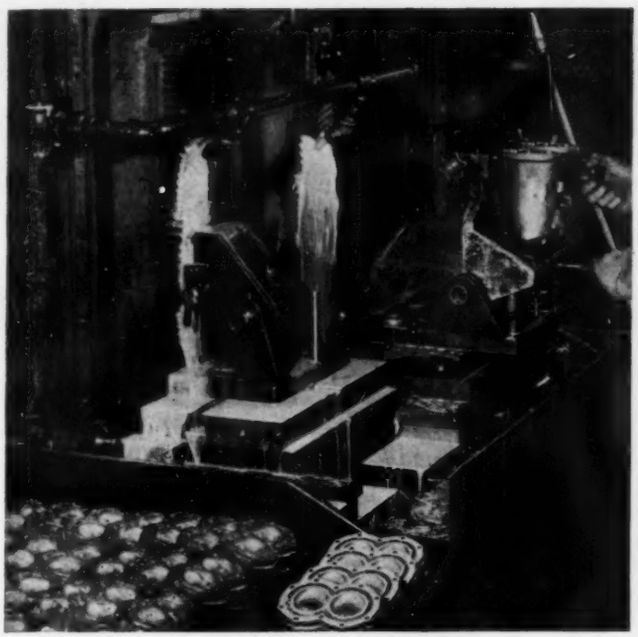
Universal Fixtures



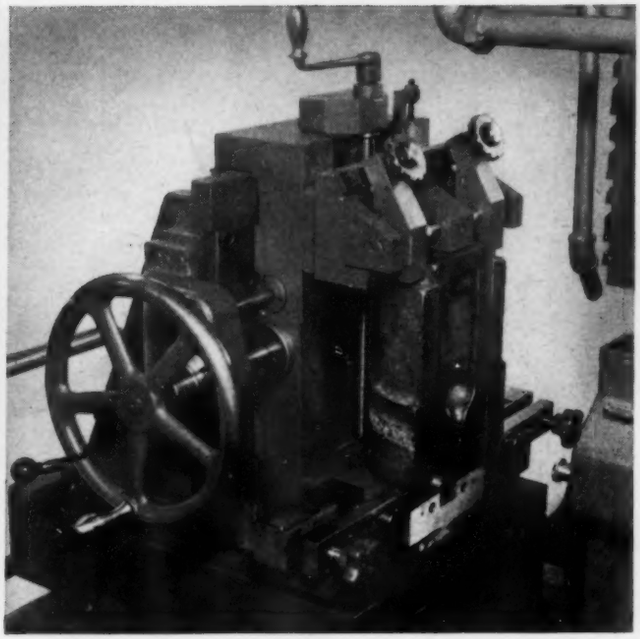



Clamp arm
Equalizer plate
Equalizer jaws
Support block
Rest block
Equalizer head
Clamp arm in position to hold largest frame.
Four lines scribed on fixture column show positions of equalizer head for different sizes of C.I. motor frames

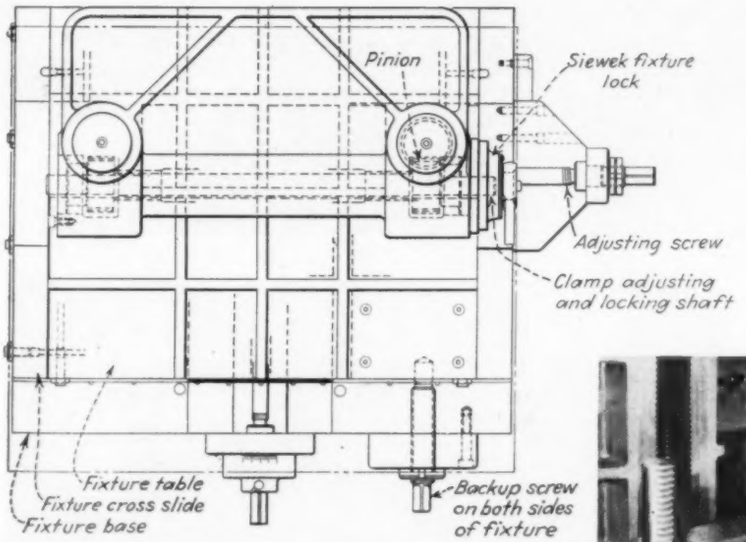
Adjustably mounted equalizer head suits any of four sizes of cast iron electric motor frames when slab broaching across feet. Used on a 5/54 Cincinnati single ram vertical Hydro-Broach with moving table, the fixture is loaded from the open left-hand side. Self-adjusting equalizer jaws on support block and top equalizer plate hold parts in alignment when clamp is tightened. Clamp locks in position at predetermined pressure so no adjustment is needed when changing from one size to another. Support blocks, equalizer plate and end stop position are changed for different parts. When fixture is locked, workpiece is raised about 1/32 in. from rest blocks and supported entirely on top and bottom equalizers. Castings range 3⅜ to 5¼ in. wide, 7 to 8¾ in. dia.

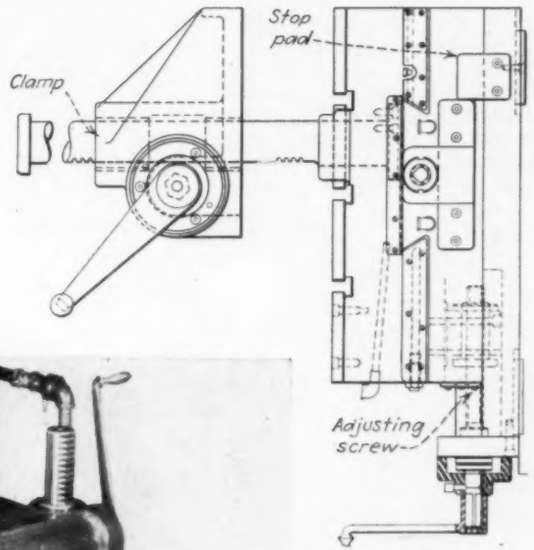


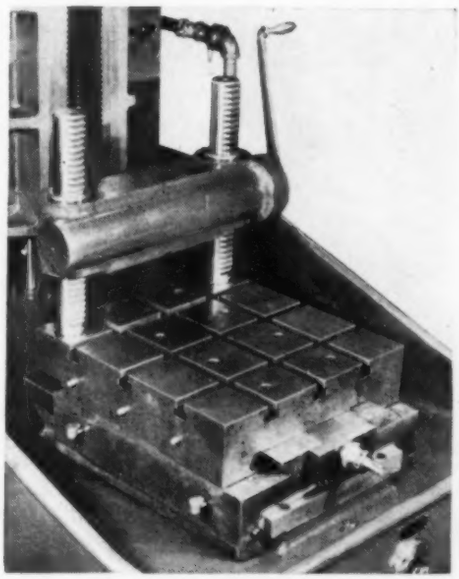
Slab broaching 18 different parts in job-lot quantities is done by Johnson Motors on this double slide Oilgear vertical machine. Different trunnion fixtures are used for each part, but each has been designed so a change from one to another on the same base can be made quickly. The trunnion shaft is removed, and hand-tilted workholding members are interchanged without difficulty. Production rate has been increased 500 to 600%



Developed especially for facing cast-iron glass molds, this universal fixture is set up on the receding table of a Cincinnati 10/66 single ram Hydro-Broach. Infeed adjustment is provided so cuts of different depth can be taken. The handwheel traverses fixture platen across machine table between passes for finishing surfaces wider than the broach insert. Different sizes of mold castings can be clamped by raising or lowering upper clamp assembly

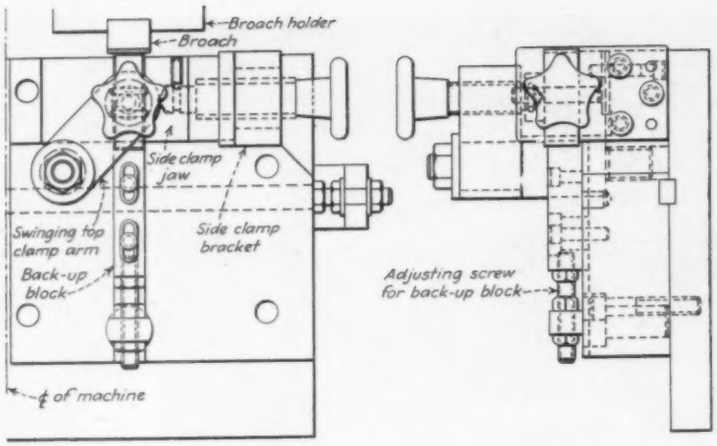






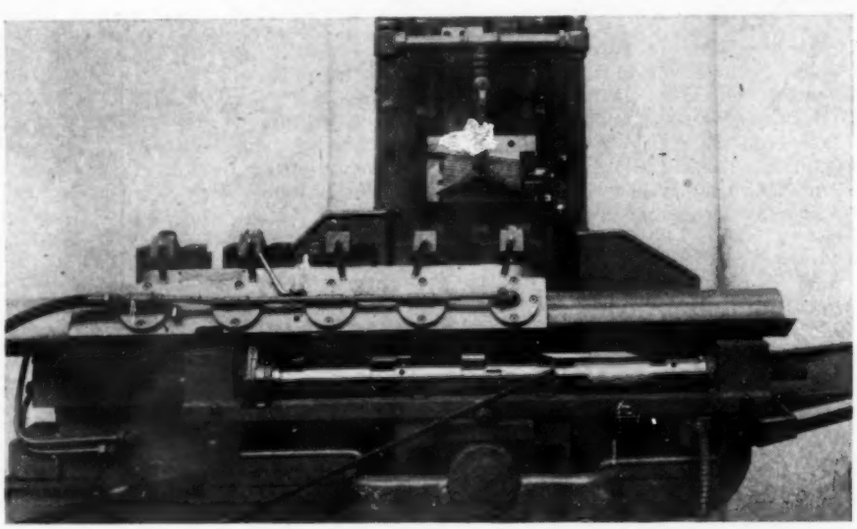
Universal fixtures developed by Detroit Broach Co. (right) and U.S. Broach Co. (above) for general purpose machining of different parts. With a 12-in. wide slab broach the Detroit fixture has been used for facing cast iron parts 10-in. high, and steel parts 4-in. high, removing ⅛-in. stock per pass. Clamp head has quick-acting lock which operates at any height when resistance to clamping pressure reaches predetermined value. On U.S. Broach fixture, table can be positioned longitudinally and transversely by heavy screws and moved 6 in. to either side of center and 3 in. front to back. Clamp head is adjustably positioned on two posts, and maximum daylight under clamp is 13 in. Clamp adjustment and locking is done with the same lever

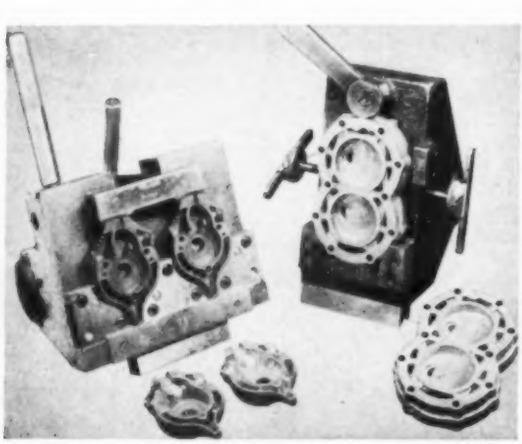
Exemplifying a method by which clamping fixtures can be made more versatile, is this hydraulic fixture for holding four sizes of bearing caps for broaching bolt bosses. Four-sided clamp jaw on end of overhead clamp arm can be set for required part by rotating it about holding bolt. Horizontal hydraulic cylinder is connected to clamp arm by adjustable rod so movement of arm can be varied. Developed by Detroit Broach Co., fixture may be used on several types of vertical surface broaching machines equipped with moving tables



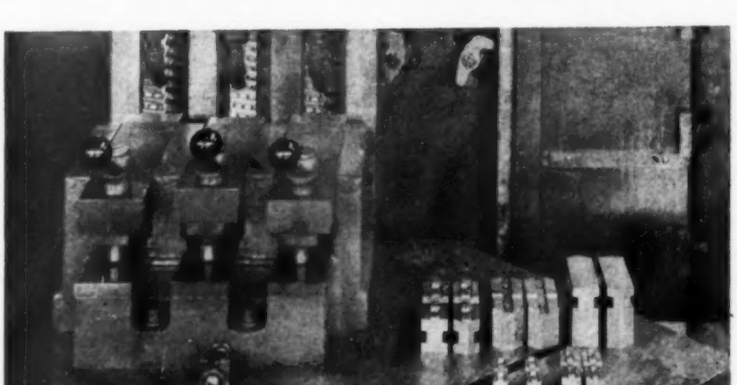
Broaching to length of small bronze microscope parts is performed in this universal fixture developed for mounting on right-hand side of shuttle table of a 10-ton American SB-54-10 single-slide machine. Part is held between fixed and movable side clamp jaws, and is locked by a swinging screw clamp. Backup block is adjustable on base to suit parts of varying lengths

Cutting rack teeth on operating bars of business machines is performed by the lateral index method originally developed for cutting bandsaw teeth. Fixture is mounted on receding table of a 3-ton Cincinnati vertical Hydro-Broach, and has hydraulic clamps. Work is positioned against end stop. Ram carries several sets of broach inserts; the first faces off the rack and the others cut the teeth. As table recedes, index bar automatically indexes fixture a predetermined distance to position part for next cut.

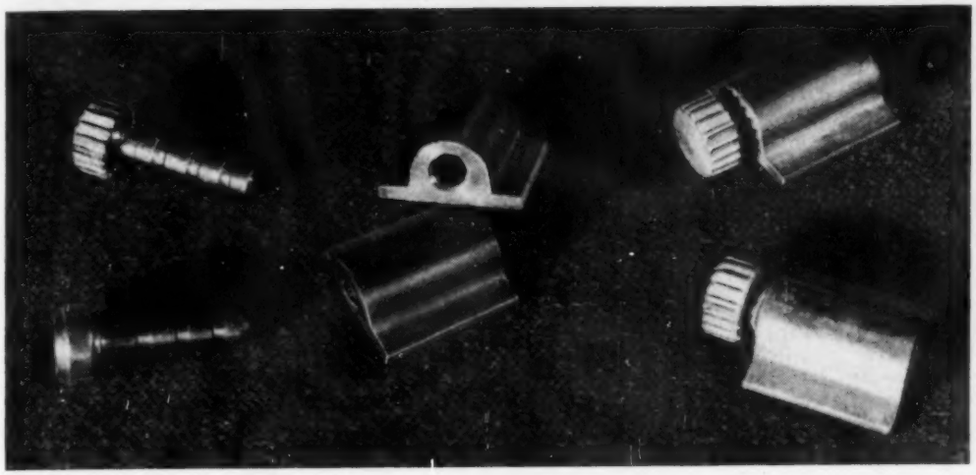




Trunnion members for use in universal fixtures designed by Johnson Motors for slab broaching aluminum-alloy die castings. Two different sizes are available to fit accurately in precision-made bases. Precision V-blocks contact mating V-rails on fixture base when tilting members are moved forward by hand into broaching position



Lathe chuck jaws in 20 different types and sizes are broached on both ends in this setup on one side of a Cincinnati 10/66 vertical duplex Hydro-Broach. The other side ram is available for other operations on same parts. Left-hand station broaches two bevels and a concave radius on front end of all jaws. Center station forms convex radius on back end of 15 different types, and right-hand station produces different type of back end on five models. Locating and clamping details for each type of jaw are interchangeable. All jaws are broached in left-hand station and then in either second or third as may be required. Output is 137 per hr.



Thermal release units in Square D overload relays (right) consist of ratchet shafts (left) and solder cups (center), joined with special solder which releases within a narrow temperature range. Production at reasonable cost has been made possible by development of special automatic machines, including a dial-type soldering unit for assembly

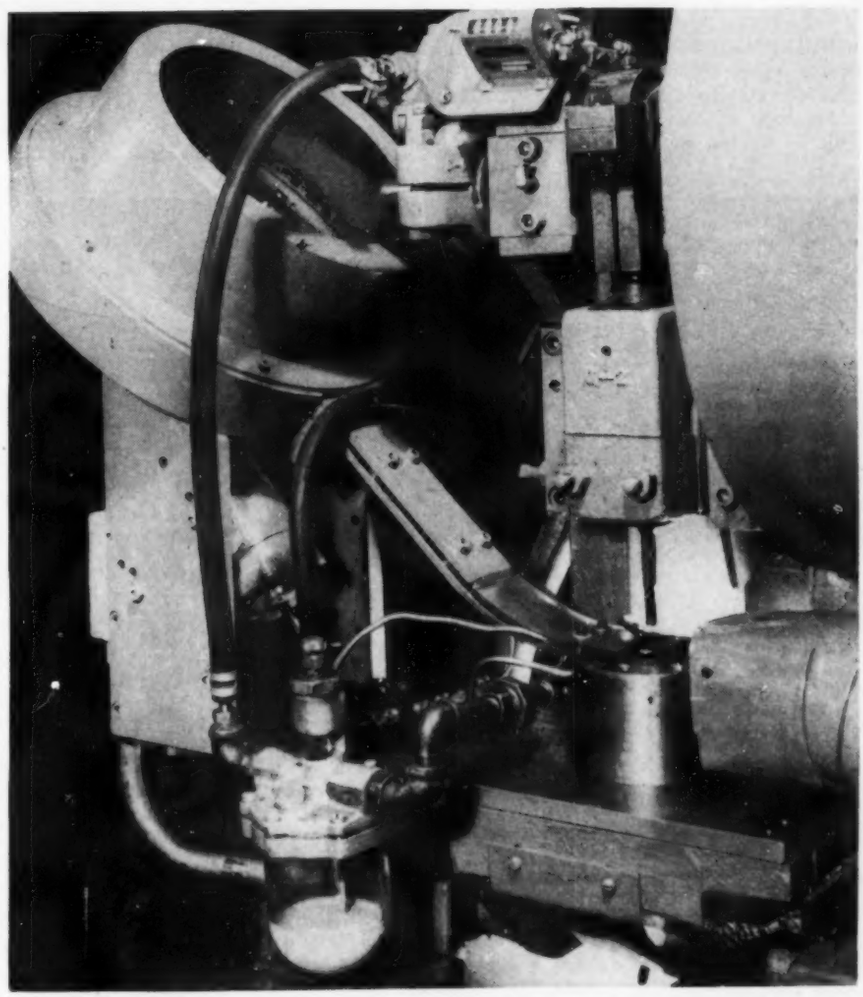
Tricky Tooling Cuts Relay Costs

Ingenious tooling and automatic feeding and clamping convert standard machine tools into high-production equipment

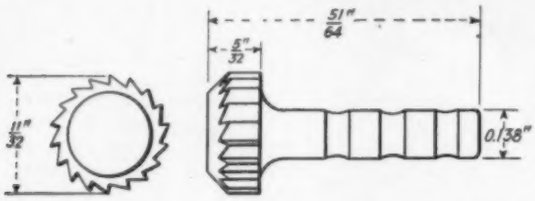
BY PAUL BONNESS
Superintendent, Industrial Controller Div.
SQUARE D CO.

ECONOMICAL production of ratchet release elements for Square D thermal overload relays is made possible by four small automatic machines. These include a special broaching press for cutting the 18 teeth on the ratchet-shaft head, a small automatic cutoff saw arranged to use two circular-saw blades so two pieces can be cut off at each stroke, an automatic drillpress for drilling the heater solder cups, and a special dial-type soldering machine for assembling ratchet shafts in cups.

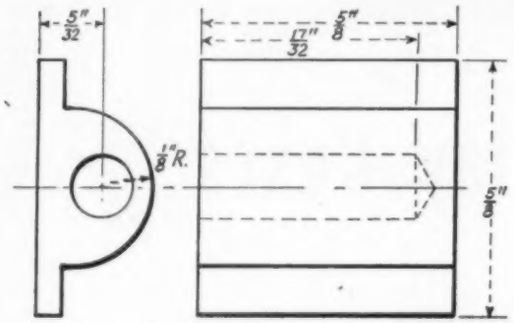
Wherever possible, standard machines and accessories have been used in constructing these automatic units. For example, the broaching press is a small No. 2 Roselle C-frame punch press with a special hopper feed. The press operates at 60 strokes per min., and the hopper drum is revolved at 2 rpm. by a 1/16-hp. geared-head electric motor through a friction clutch. All the operator does is fill the hopper and inspect oc-



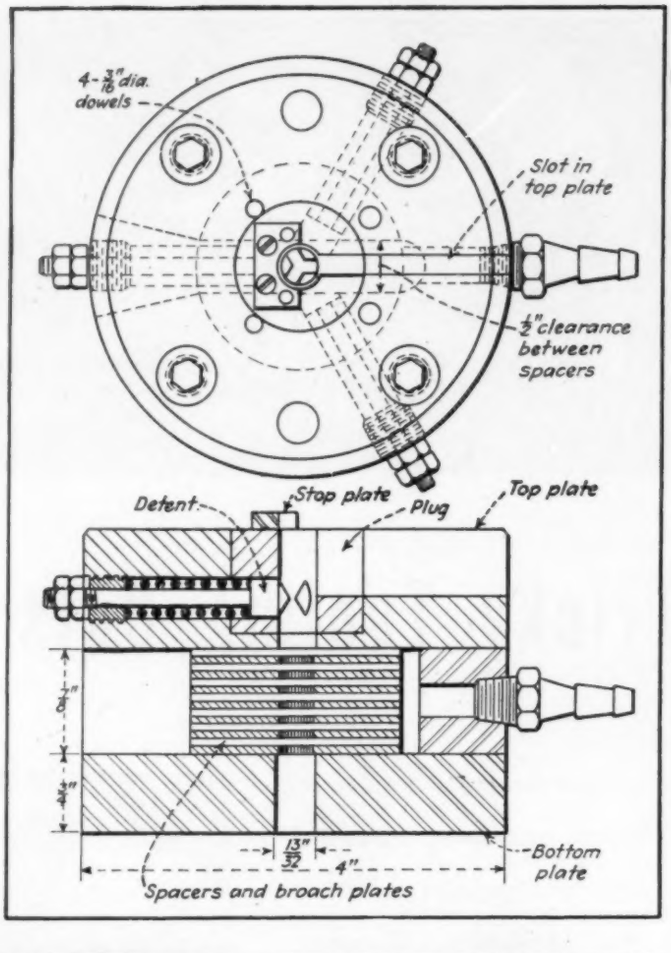
18 TEETH ARE CUT on the head of the ratchet shaft in this hopper-fed broaching press. Shafts are pushed through a broaching die one at a time with a small punch. Production is 3600 shafts per hr. at 100% efficiency



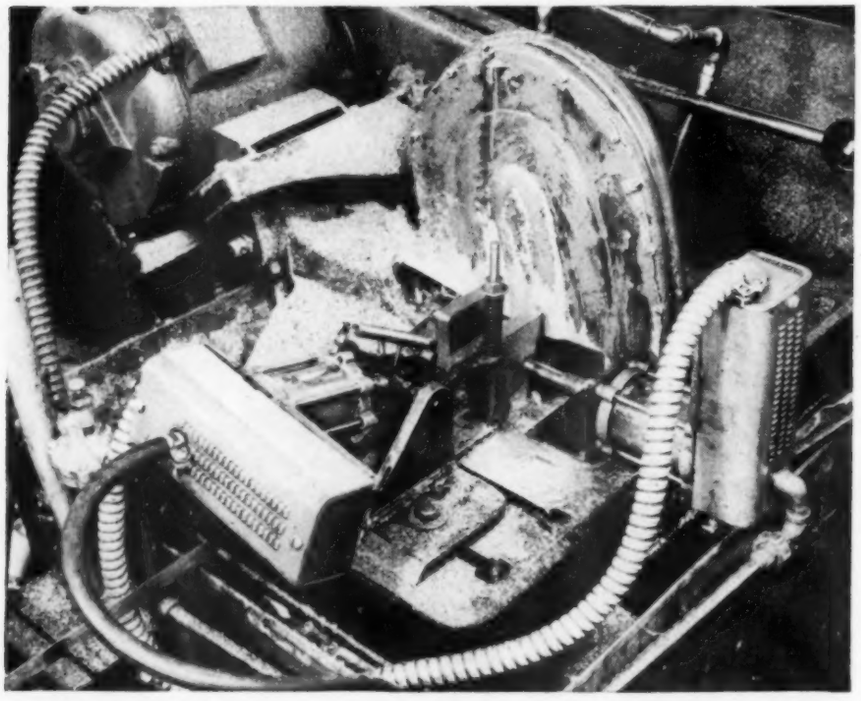
RATCHET SHAFTS, formerly turned from toothed, extruded, 11/32 dia. brass rod, now are made from round rod by turning, grooving and chamfering in automatic screw machines, then broaching the teeth. Savings in the cost of the rod more than pay for broaching, and production is considerably higher



SOLDER CUPS, originally cut off in automatic screw machines at 200 per hr., are now cut from extruded brass rods, two at a time, in an automatic Delta circular saw at 3500 per hr. The 0.144-in. dia. solder hole is drilled automatically in a second operation



SEVEN-PLATE BROACH assembly in the die. Above the broach plates are three spring-loaded detents which align the shaft with the axis of the broach teeth before the punch forces it through the plate. Top plate of the die is slotted to permit passage of the shaft from the hopper chute to the broaching position



SOLENOID-CONTROLLED Bellows-Senacon air cylinders feed the stock 1 5/16 in., clamp it for sawing, and oscillate the wheelhead on this automatic Delta circular saw used for cutting solder-cup sections from extruded bar stock. Two 7-in. dia. 1/16-in. thick saws spaced ⅝ in. apart cut off two cup sections per stroke. Limit switches and time-delay relays control the automatic cycle. Oscillating, work feed and clamping cylinders are interlocked electrically for smooth automatic operation and to prevent accidents to machine or operator

casionally to insure that shafts are feeding properly to the die.

Broaching Die

The broaching die is an assembly of three 4-in. dia. steel plates bolted and doweled together. Assembled in the 1 5/32-in. thick top plate is a hardened tool-steel plug, 1¼ in. in dia. and 1 in. thick, drilled for vertical passage of the shafts. A stop plate on top of the plug locates the shafts in line with the broach plates.

In the center of the die are seven broach plates, each 2 in. in dia. and 1/16 in. thick. These are arranged for a chip load of 0.005 in. per tooth in the first six plates and 0.0015 in. for the seventh.

Separating each pair of plates are two half-round spacers 1/16 in. thick. The ½-in. wide channel left between each pair of broach plates

permits passage of compressed air to blow chips out through a channel milled in the center die plate. A standard lubricator sprays soluble-oil solution between the plates with the compressed air and lubricates the broach teeth.

The bottom plate of the die assembly has a 13/32-in. hole in the center for clearance of finish-broached shafts. A tapered plug serrated to fit into the bore of each of the seven broaching plates aligns these for doweling within the center plate. The assembly of plates and spacers is fitted into the die as a unit, and when wear occurs the entire unit is replaced.

Following broaching, ratchet shafts are bright dipped, then are ready for assembly in the heater solder cups.

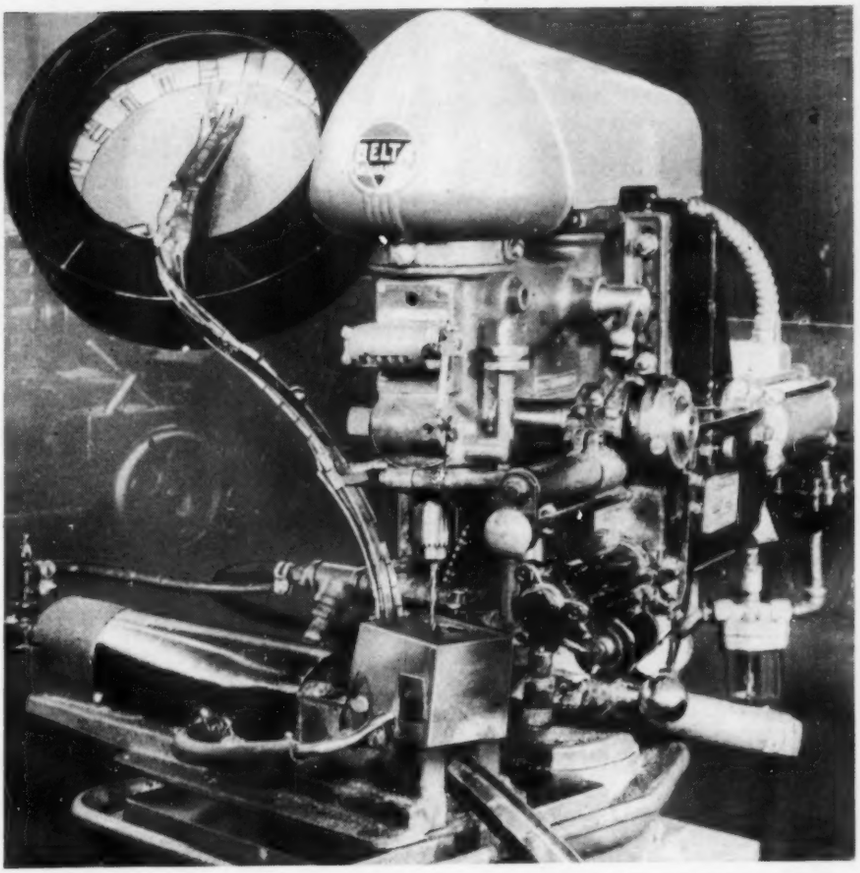
Solder Cups

Two operations are required to produce the cups from extruded brass rods. First rods are cut off in an automatic Delta saw and then drilled to a depth of 17/32 in. ± 0.007 in., with a No. 27 drill in a special hopper feed, Delta drillpress.

Production averages 3000 pieces per hr. Hard-chrome-plated drills average 17,800 pieces between grinds. This is much greater than that possible with unplated drills. After deburring and bright dipping, cups are ready for assembly with shafts.

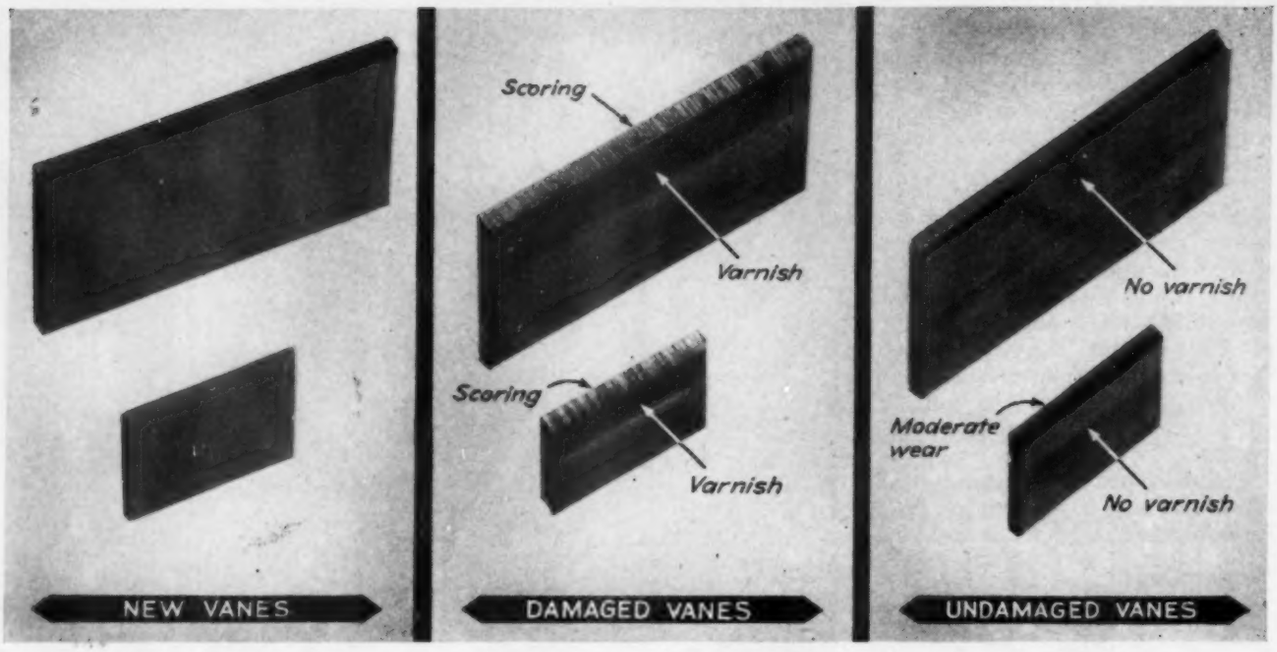
Finished and cleaned shafts and cups are delivered to the assembling machine where cups are loaded into a chute for feeding into the T-slots around the periphery of the constantly rotating dial. As cups pass under an electrically heated pot, a measured quantity of molten solder is fed automatically into each, a shaft dropped in, and a cam-controlled wiper alternately dipped into an acid-flux pot and brought up against the passing shaft.

At the next station, cups wipe against two spring-loaded carbon contact pads, and current (75 amp. at 6 volts dc.) is passed through the cup to heat solder to 250-300 F. Then, before the solder has solidified, an air-turbine-driven brush makes contact with the ratchet head, spinning the shaft to insure adequate tinning of both shaft and cup bore. The rotaing dial finally carries assemblies to a chute for delivery to a pan on the bench beside the machine. Solder in the cups cools sufficiently before reaching the delivery chute to insure solidification. Production is about 1200 assemblies per hr. at 100% efficiency.



SOLDER CUPS are drilled with chrome-plated twist drills at 3000 per hr. in this Delta automatic drillpress. The Bellows-Senacon feed unit, equipped with a Hydrocheck device, is interlocked electrically with the solenoid-operated Mead air clamping cylinder on the table. Air jets blow drilled pieces out of clamp jaws, and at the same time serve to keep jaws clear of chips

SHAFTS AND CUPS are assembled automatically in this dial-type machine. Operator keeps feed chute filled with cups, and inserts shafts by hand after a measured amount of special solder has been dropped automatically into each cup. Machine then fluxes shafts, heats the solder to proper temperature, spins shafts to insure proper timing and finally ejects the finished assemblies. The 9-in. dia. dial has 20 vertical slots and rotates at 1 rpm.



COMPARATIVE EFFECTS of unsuitable and properly selected hydraulic oils are graphically shown with respect to their effects upon the vanes of a rotary-vane pump. The damaged vanes operated in an oil that lacked oxidation stability and lubricating value. But the undamaged vanes operated for a long time with little wear because the oil was properly processed with oxidation inhibitors and oiliness agents

What to Look for in Hydraulic Oils...V

OXIDATION STABILITY

Excessive heat or presence of contaminants will change the oil's properties and give rise to erratic operation or damage to the hydraulic mechanisms

BY ANTHONY J. ZINO, JR., LUBRICATION ENGINEER

THE ABILITY of an oil to resist polymerization and thermal decomposition in the presence of air, water, heat and dissimilar metals is termed oxidation stability. The greater an oil's resistance to change in its original physical and chemical structure, the higher its stability. Experience has shown that stability of a hydraulic fluid is governed by two factors:

1. *Composition of the Fluid*—Arising from the crudes from which it is made, the refining method and subsequent treatment with additives.

2. *Conditions Under Which Fluid Must Function*—Temperatures, pressures, extrinsic contaminants and reactive metals.

The basic crudes from which hydraulic oil stocks can be made are Pennsylvania, Mid-Continent, Gulf Coastal and California. No two crudes are identical in chemical or physical composition. They all require individual attention and special processing to produce the stocks most suitable for hydraulic service. More attention is normally required in producing hydraulic oil stocks than oil stocks for machinery lubrication.

From each of the above crudes, it is possible to produce finished hydraulic oils with a high resistance to oxidation. Additional processing with organic compounds known as oxidation inhibitors further increases the oxidation stability. This is particularly true when both the oil stocks and the additives are completely compatible.

Since the ultimate stability of hydraulic fluid depends on the conditions under which it must function, consider the various service factors. Temperature of the fluid is probably the most important operating condition. Field experience and test results demonstrate the optimum temperature range is 110 to 130 F. for mechanical efficiency of the equipment and oxidation stability of the fluid. If fluid temperature is below 110 F., increased viscosity has a marked effect on the mechanical efficiency of the equipment; with fluid temperature above 130 F., oxidation stability of the fluid may suffer.

There are a number of causes for

excessive generation of heat within a hydraulic circuit and a consequent rise in fluid temperature. Operating temperature of the fluid is governed by the energy absorbed at the pump to perform the work for which the hydraulic circuit was designed and to overcome the resistance of valves, elbows and piping to fluid flow. Although not always apparent, further sources of heat are fluid actions such as "wire-drawing" through flow-control valves; constant "oil-shearing" in the pump and certain valve mechanisms; added turbulence caused by velocity, pressure and directional changes, and localized "hot spots" caused by rupture of the oil film and the subsequent metal-to-metal contact.

The effects of temperature on oxidation stability are usually reflected by either polymerization or thermal decomposition of the fluid. In the case of polymerization, analysis of used oil will show a thickening or increase in viscosity. This typical field report shows what takes place:

The new oil was an exceptionally fine grade of hydraulic oil. After six months of continuous service in the hydraulic system of a 150-ton compression molding press (oil temperature 140 F. throughout the entire period), a definite increase in viscosity had occurred.

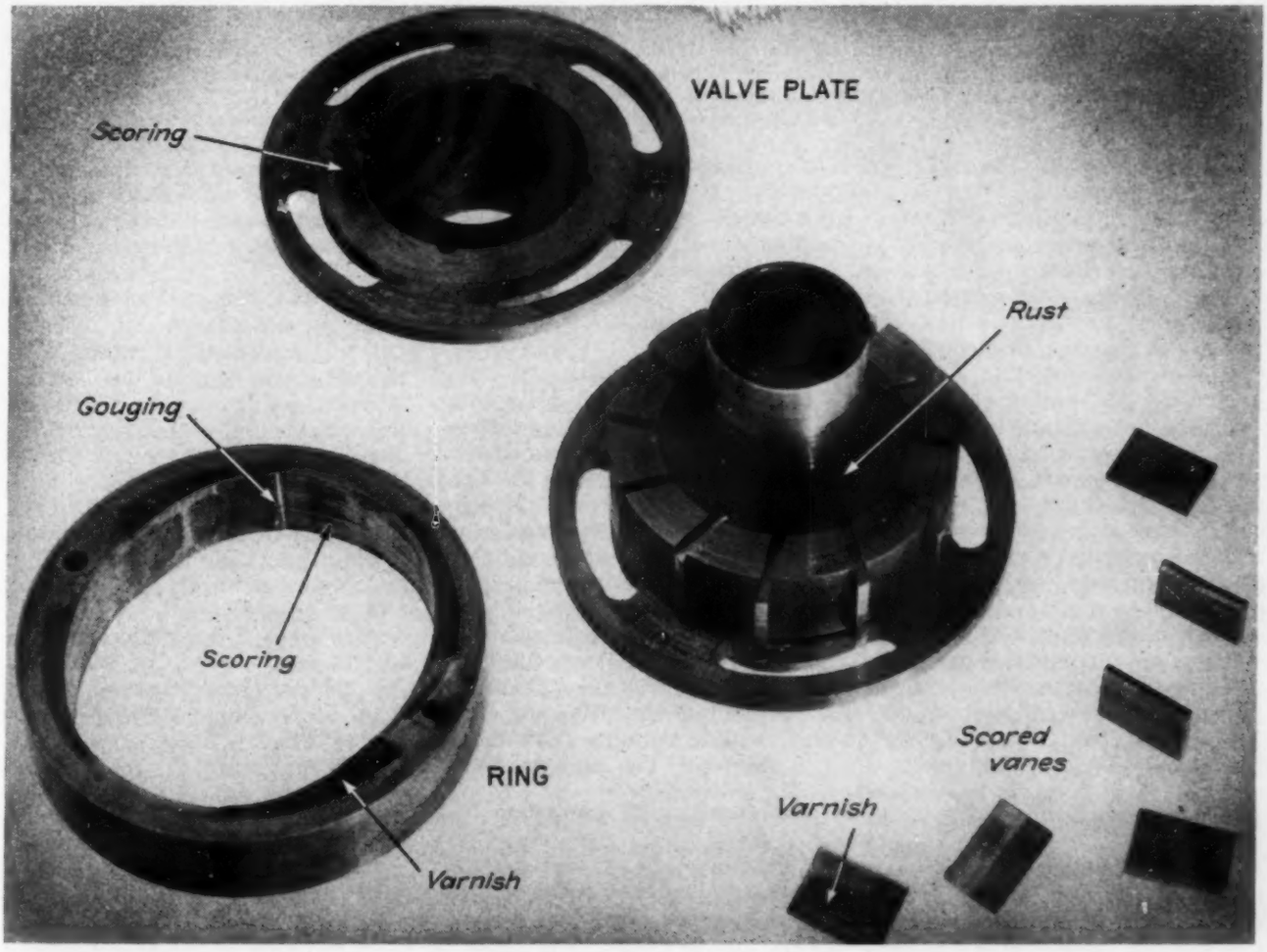
	NEW OIL	USED OIL
Viscosity at 100 F., S.U.S.	173	296
Viscosity Increase, %...	–	70
Viscosity at 210 F., S.U.S.	44.7	51.1
Viscosity Increase, %...	–	14
Neutralization Number.....	neutral	neutral
Naphtha Insolubles, %..	–	trace

Cleanliness of the used oil is indicated by the extremely low impurity, or naphtha insoluble, content. If the naphtha insoluble content had been high, thermal decomposition would also be shown.

Where thermal decomposition has taken place, its effect on equipment is evident at once. Pistons as well as vanes become coated with lacquer or varnish films of various degrees of hardness and thickness. Valves become badly sludged, gummed or carbonized. Vibration and chatter are noticeable. Invariably, operation of the equipment is sluggish. Many pump failures have resulted from the buildup of sludge and varnish on working surfaces.

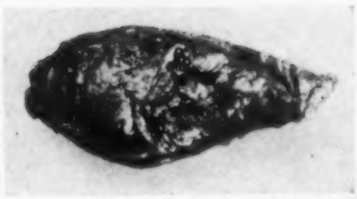
Careful study should be given to problems caused by heat and high operating temperature before any action is taken. In the first place, if the problem is chronic, the complete hydraulic circuit should be inspected. Valve settings and arrangements should be checked carefully. There have been many cases where operators have complained of high oil temperatures and thermal decomposition of the fluid, but investigation disclosed that certain valves had been improperly installed.

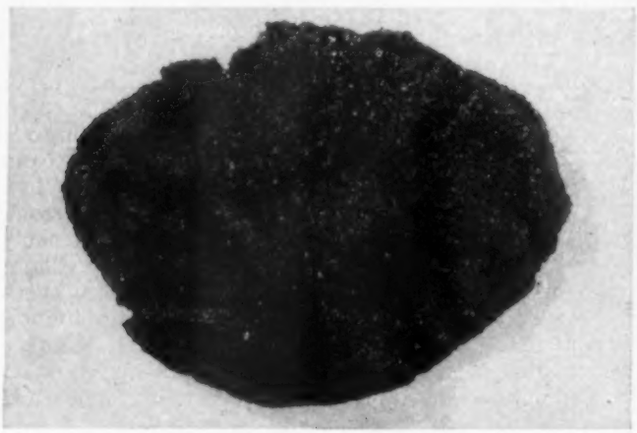
Reservoir capacity should be checked for adequate settling and



WATER IN THE HYDRAULIC OIL destroyed its oxidation stability and lubricating value, causing progressive damage to this rotary-vane pump: (1) rusting, (2) varnishing of finished surfaces, (3) scoring of the ring and valve plate, (4) gouging of the ring. If the process had proceeded further, the rotor segments would eventually have broken as illustrated in installment I of this series of articles

METALLIC WELDING BEAD
Cause for a stuck 4-way valve was this welding bead dropped accidentally into the circuit during fabrication of the circuit





PIPE COMPOUND improperly applied to joints will clog filter so pump and valves are starved for oil

CHIPS should be removed from all castings or other machined parts prior to assembly to avoid clogging filter

Contamination of hydraulic oil may arise from carelessness when the machine is built. Manufacturers should set up control standards to prevent the occurrences pictured, because these are not as infrequent as might be supposed *Photographs courtesy E. F. Houghton & Co.*

cooling. Where high oil temperature is a problem, reservoir capacity is sometimes too small for the size of hydraulic pump. Reservoir capacity should be at least 2½ to 3 times the capacity of the pump in g.p.m. Where design of the equipment does not permit the installation of a larger reservoir, the addition of oil coolers is definitely beneficial.

Prior to making extensive mechanical changes, study the hydraulic fluid. Check its viscosity characteristics against the recommendations of the pump manufacturer (installment II). A change to a hydraulic oil possessing higher viscosity index and greater oiliness can also improve the operating characteristics of the hydraulic circuit, and effect a reduction in the fluid's operating temperature.

Extrinsic Contaminants

Another condition that adversely affects stability of hydraulic fluid and shortens its life-expectancy is the presence of extrinsic contaminants. These come from sources other than thermal decomposition of the fluid. The most important of these contaminants—entrained water —has already been discussed in the previous section—"Demulsibility!" But other serious impurities are cutting oils or coolants, pipe threading compounds, lacquers, paints, rust-preventive compounds, greases, drawing compounds, core sand and dirt.

The immediate effects of these foreign substances are obvious with respect to the finely finished surfaces of valves, pumps and pistons. Scored and corroded pump parts and valves are typical results. Machine down-time and loss of production are more serious than loss of oil or cost of parts. But, until the real source or cause of the situation has been determined, careful study should be given to all possible contributing factors. Chemical and physical analysis of the used oil should be one of the first steps undertaken. As in the following case, the basic cause will be then revealed.

The operator of a hydraulically operated milling machine continuously complained about sluggish operation and chatter of his machine. Frequent oil changes and flushings of the hydraulic system temporarily improved the situation but invariably the problem recurred after three to four weeks of operation. Finally, an analysis of the used oil (below) revealed the presence of cutting oil. The situation was subsequently corrected by mechanical changes in the machine.

USED OIL FROM MILLING MACHINE

New oil, S.U.S. viscosity	300
Used oil, viscosity after 4 wks.	408
Neutralization Number	2.9
Water Content, %	0.1
Saponifiables, %	4.7
Chlorine, %	0.1
Sulphur, %	Positive

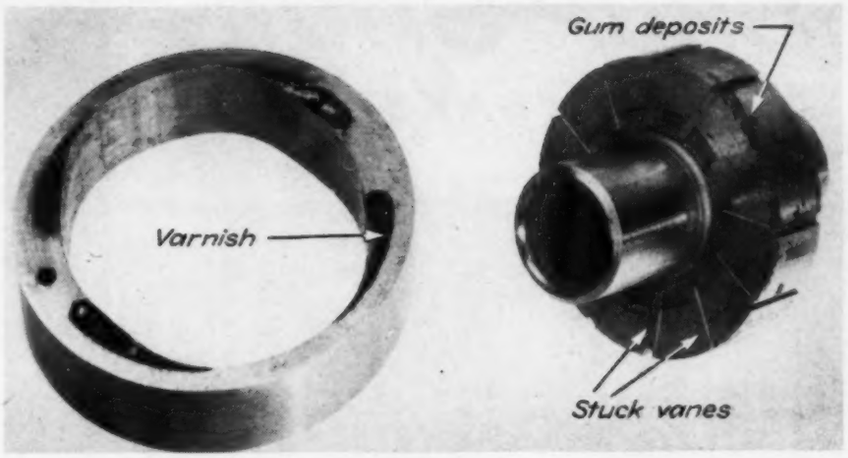
Presence of contaminants in the hydraulic fluid can usually be traced to any one of three causes:

1. Machine design
2. Improper material standards and control
3. Lack of preventive maintenance

Proper machine design can definitely provide better protection against the entrance of foreign matter such as cutting oils, coolants, dirt and water into the hydraulic system. Installation of efficient filters of proper capacity by the machine builder is a definite asset to the operator. Adequate material standards and control during the process of construction will prevent the use of unstable oil-soluble paints and lacquers on oil reservoir surfaces, and insure against the use of hy-

draulic piping, fittings, valves and other equipment which have not been inspected and cleaned before assembly.

The adoption of preventive maintenance standards and schedules within the user's plant will: (1) eliminate the use of the wrong product in the hydraulic system; (2) minimize oil leakage and entrance of extrinsic contaminants into the system from the deterioration of hydraulic packings and seals; (3) minimize the effects of these contaminants by periodic checks on oil condition and machinery operation; and (4) insure longer equipment life by periodic oil changes.



WITHIN A WEEK'S USE of uninhibited oil, gum deposits formed in this rotary-vane pump. If the owner had used an oil containing proper additives, to prevent the formation and precipitation of gums, the pump would have operated satisfactorily for a long period

Reactive Metals

Field experience and laboratory tests have proved that oxidation stability of petroleum oils is adversely affected by the catalytic effect of metals. The rate of oxidation is directly influenced by the types of metals in contact with the oil, the contaminants present and the temperature of the oil. Of various metals used in construction of hydraulic circuits and equipment, copper and its alloys have probably the greatest catalytic effect. They should be eliminated wherever possible. The less reactive metals are zinc, lead, iron, tin, and aluminum. The last two metals in this list are the least reactive.

Contaminants, such as water, as previously mentioned tend to accelerate the deterioration of the hydraulic fluid in the presence of these metals. Furthermore, the rate of oxidation rises sharply with temperature due to the increased catalytic effect of the metals. Temperatures in excess of 150 F. should be avoided.

To overcome the effects of reactive metals, more study should be given to the types of metals being used in the hydraulic pumps, valves, tubing, cylinders and oil coolers. It has been demonstrated by several machine tool builders that the removal of bronze sleeves from hydraulic cylinders has greatly extended the life of the fluid.

Operating Pressures

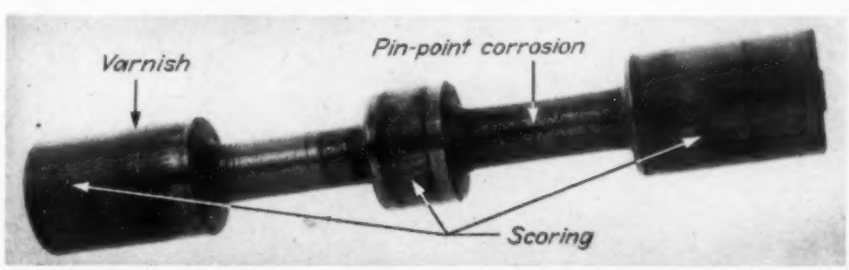
The pressures under which hydraulic fluids must function also have a direct bearing on their ultimate stability in service. It has already been shown that the viscosity of petroleum oils increases directly with pressure. Moreover, as frictional losses throughout a circuit are also proportional to viscosity, it follows that increased pressures mean greater frictional losses and higher operating temperatures.

Fortunately, the fluid pressure in the average circuit, as employed by machine tool builders, rarely exceeds 1500 to 2000 psi. Although continuous operation at these pressures does have an effect on stability of the fluid, it is by no means critical. Operation at higher pressures requires more serious consideration.

At present, there are no accepted laboratory tests for evaluating oxidation stability of hydraulic oils for industrial applications. Such tests, as the Sligh, Underwood, and Continental, (originally developed for evaluation of engine oils) have unfortunately been extended to industrial oils. But results from these tests are usually of little value in predicting service performance characteristics because conditions under which hydraulic fluids must function are so radically different from those encountered by engine oils.

One test which does merit consideration is the A.S.T.M. "Proposed Method of Test for Oxidation Characteristics of Steam Turbine Oils." In this test, the oil is oxidized at approximately 95 C. in the presence of water and an iron-copper catalyst by bubbling pure oxygen through the oil at a constant rate. Test is continued until such time as the oil's neutralization number has reached a value of 2.0. The oil's service life is then expressed in number of hours. Although originally proposed for the evaluation of turbine oils, this test with a slight modification in procedure is well suited as a qualitative screening test for hydraulic oils.

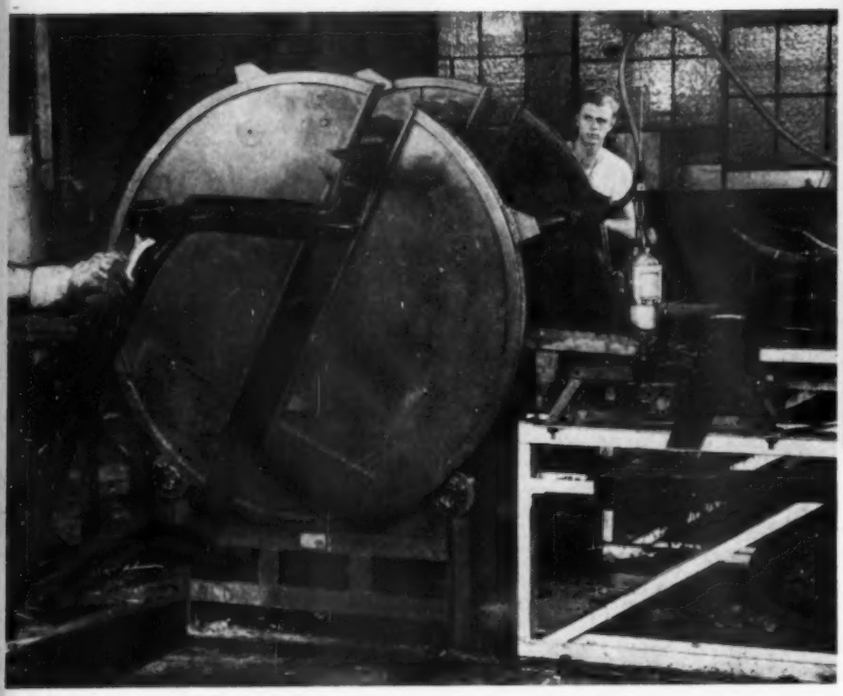
The proposed change consists of removing the water from intimate contact with the oil and the metals and instead to bubble air or pure oxygen saturated with water vapor through the oil. A test operated in this manner would approximately hydraulic operation more closely and results would be of more value in correlating field experiences with laboratory tests. A laboratory test, operated under approximately these conditions, has been developed and employed for several years by C. L. Pope, lubrication engineer, Eastman Kodak Company.

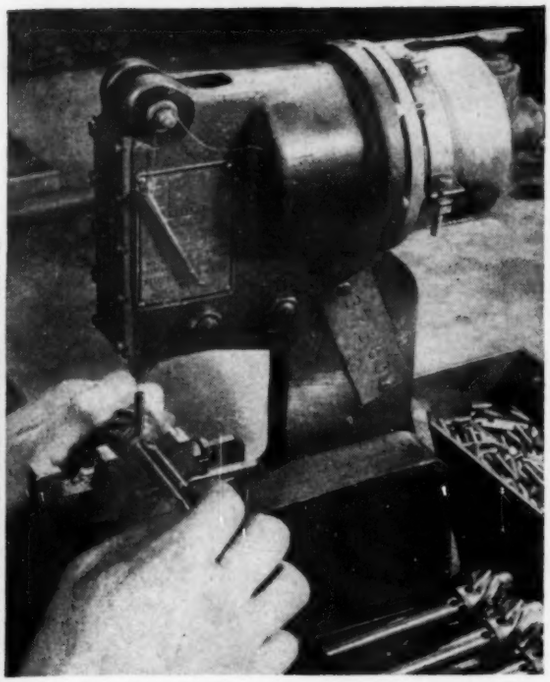


THIS 4-WAY VALVE SPOOL FAILED because the hydraulic oil lacked oxidation stability. Varnish occurred, acids were formed to cause pin-point corrosion, and a decline in lubricating value brought on scoring

Part VI—Lubricating Value—will appear in an early number.

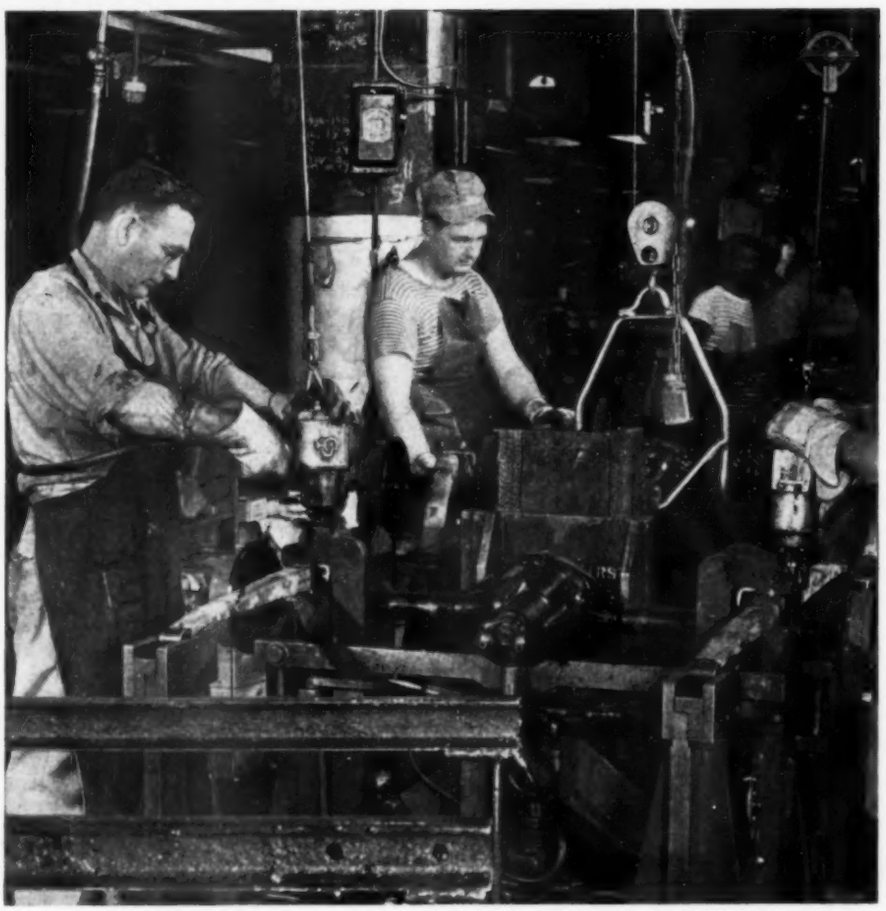
SHOP SHOTS
AT STUDEBAKER



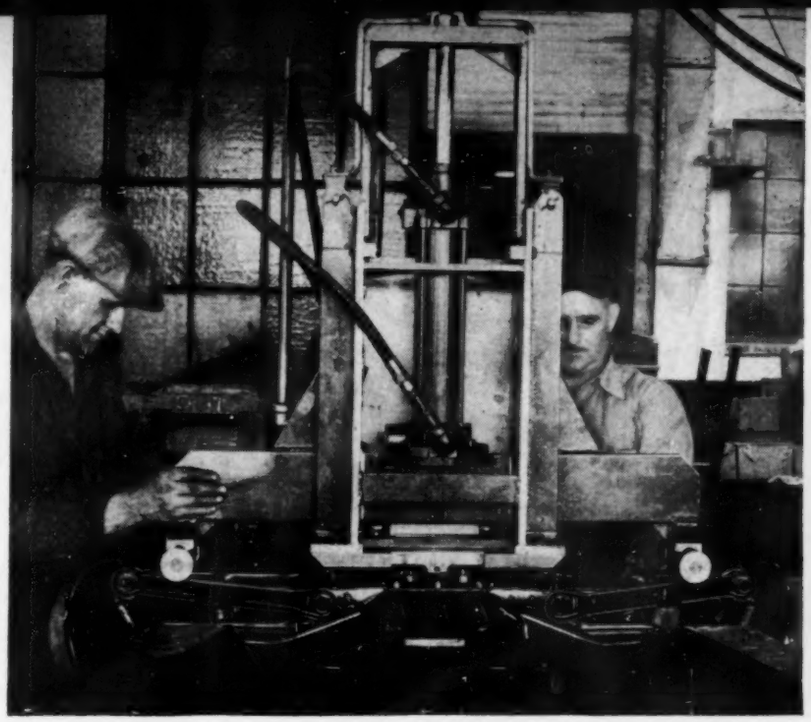


COMPRESSION RIVETER replaces hand hammer for assembling and staking pins in oil pump shafts. Pin is properly spaced and staked at one end as shown. Assembly is then turned over and placed in second position to stake other end. Adjustable stops locate sliding base in both positions. Fixture has almost eliminated scrap losses at this operation

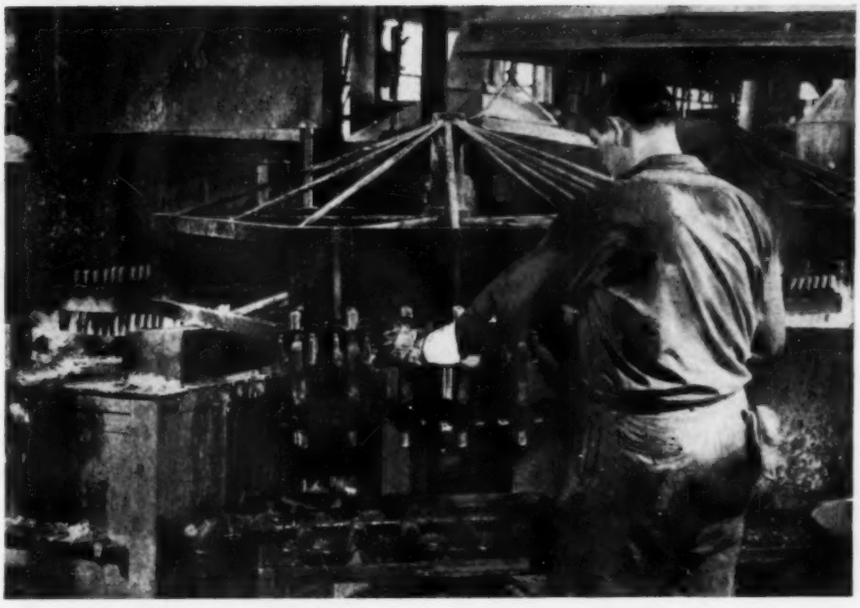
TURNOVER FIXTURE at start of frame assembly line eliminates a hazardous hoisting operation. Fixture consists of two slotted disks held together by tie-rods. Counterweights welded on each disk make rotation of fixture easy and safe. Stops locate slots for movement of frame into and out of fixture. Fixture rotates on four ball-bearing rollers supported by welded base. Machined frames are delivered bottom side up to conveyor at right



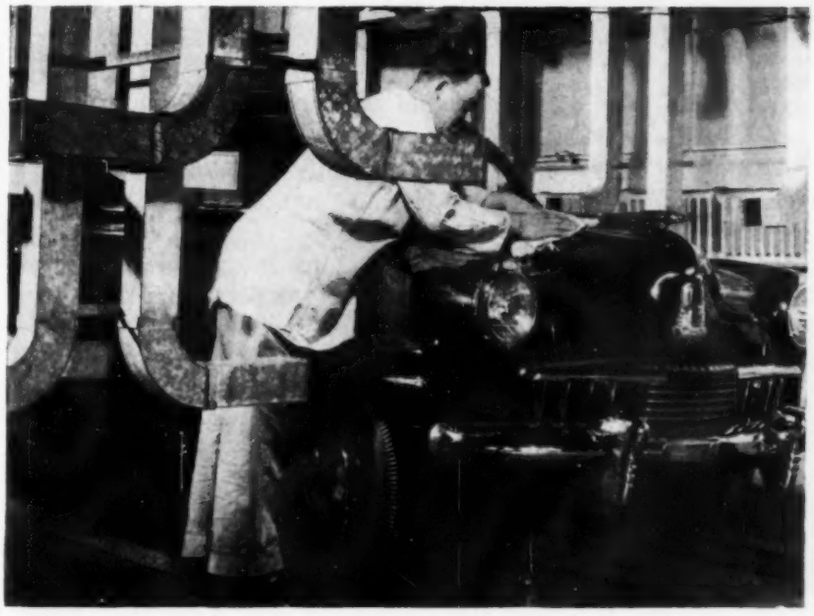
SPRINGS ARE ATTACHED to rear axles under full load to guard against stretching of bolts or stripping threads. They are loosely assembled to the axles by U-bolts, on rails leading to the compression fixture. Assembly is then clamped in the fixture and hydraulic cylinders compress both springs simultaneously. Power wrenches are suspended from self-winding cables within easy reach of operators



HYDRAULIC FIXTURES on frame assembly line facilitate placing clamps to hold transverse spring while fitting shims between upper yoke and frame to set front-wheel camber. One fixture depresses spring so clamp can be positioned, and a second removes the clamps. At conveyor stations between fixtures, shims and fastening bolts are added and yoke bolts tightened. Fixtures have stationary center hook and hydraulically operated vertical slide. In operation, slide moves down, engaging the lower yokes with rollers while stationary hook engages frame crossmember. When not in use, fixtures are drawn up out of the way by means of spring-loaded cables

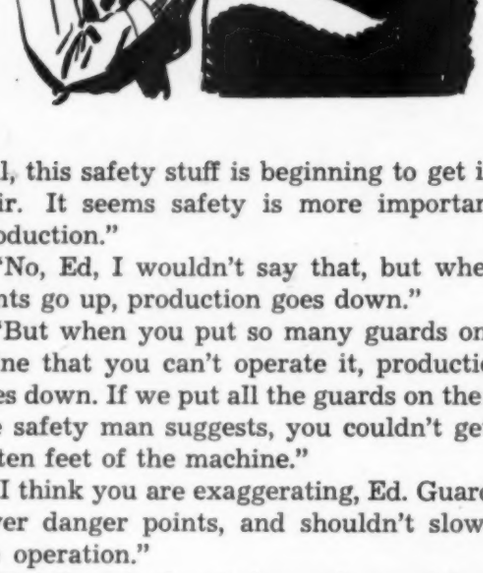


HEXAGONAL MERRY-GO-ROUND supported in center by air cylinder, holds steering-knuckle support arms and clutch operating shafts for cyanide hardening and oil quenching. Racks for holding small parts extend from alternate sides of frame. When one rack is indexed for immersion of parts in cyanide tank, second rack is over oil quench tank and third is at loading station. Operator stands a safe distance from cyanide tank, and physical effort is confined to moving parts the few feet separating racks from parts carriers. Indexing is by hand, and vertical movement of fixture between indexes is controlled by valve at operator's position



WORKING CONDITIONS on final touch-up conveyor lines have been improved by batteries of air blowers at the discharge end of paint touch-up ovens. Properly directed blasts of air speed cooling of sheet-metal bodies, making buffing and polishing easier to perform

ROUND TABLE



Guards or Production?

"Al, this safety stuff is beginning to get into my hair. It seems safety is more important than production."

"No, Ed, I wouldn't say that, but when accidents go up, production goes down."

"But when you put so many guards on a machine that you can't operate it, production also goes down. If we put all the guards on the shaper the safety man suggests, you couldn't get within ten feet of the machine."

"I think you are exaggerating, Ed. Guards only cover danger points, and shouldn't slow down the operation."

"But they do slow it down. Some of those contraptions may keep your fingers out, but they also make it almost impossible to get material in. I don't want anybody to get hurt, but if I am supposed to get jobs done on schedule, they'd better quit building fences around my machines. It's getting so you have to stand on your head to load and unload them."

"Ed, those guards keep your men on the job and out of the first-aid room."

"My boys are not high-school kids, Al; they have enough sense to take care of themselves. A few simple guards placed over gears are all right, but when you start covering up the feeds it is unnecessary and inefficient."

"Ed, do you realize how many thousands of men are injured in industry each year? If anything, we need more safeguards!"

"Sure, people get killed in automobiles, too—and they tell me home is the most dangerous place there is! And the bathtub leads all other home hazards, but you don't see them putting so many guards on a bathtub that you can't get in to take a bath. That's my point: They put so many guards on a machine, you can't operate it."

"Ed, I think you are just griping because some of your men complain about the guards. You should explain the guards are on the machines for the men's own good."

"Some guards do hinder the operation! The other day I was pushing Joe Latta to get a job out and he said, 'Let me take these guards off and I'll give you the job in half the time!' I believe he could. The boss says to get production; the safety man says to put on more guards. I can't do both. Either I get the jobs out or make the machines so it is impossible to get hurt."

"Ed, you always paint the picture black. Either extreme is not the answer, and I don't think the safety man tries to tie you up with unnecessary guards. All he is trying to do is help you by keeping your men safe and on the job."

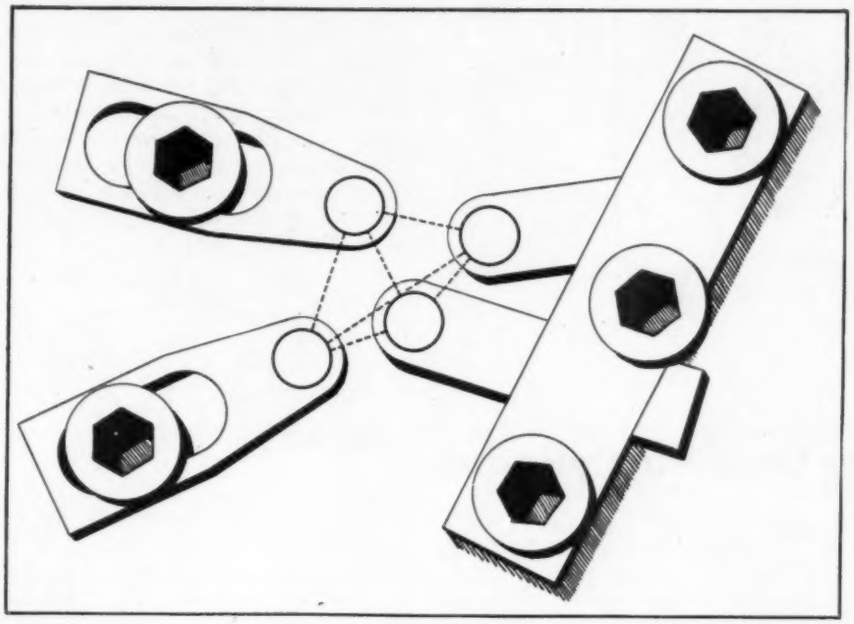
"Well, Al, if he wants to help me he can keep out of my hair and quit bringing around gadgets that hinder rather than help."

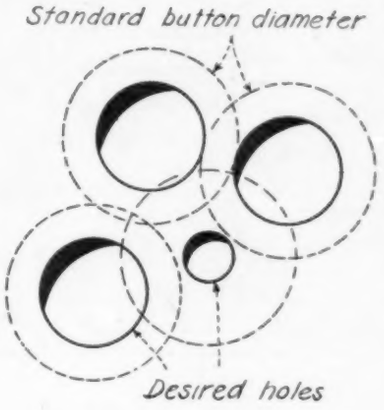
"Ed, you don't have to use every guard the safety man suggests—you can take the responsibility."

"Yeah, and if something happens, then starts the 'I told you so.' I have experienced men who know their machines. Men who know the machines, how they operate and their hazards prevent accidents—guards don't!"

ARE COMPETENT MEN *helped or hindered by safety devices? Is it true that accidents happen only to incompetents, that guards slow up the work unnecessarily? Your ideas or experience will help others who are faced with this problem. Discussions of earlier topics appear on later pages.*

Practical Ideas





When hole spacing is too close for standard buttons (above), finger-pin holders (left) can do the job. Layout dimensions between the pins are indicated as dashed lines

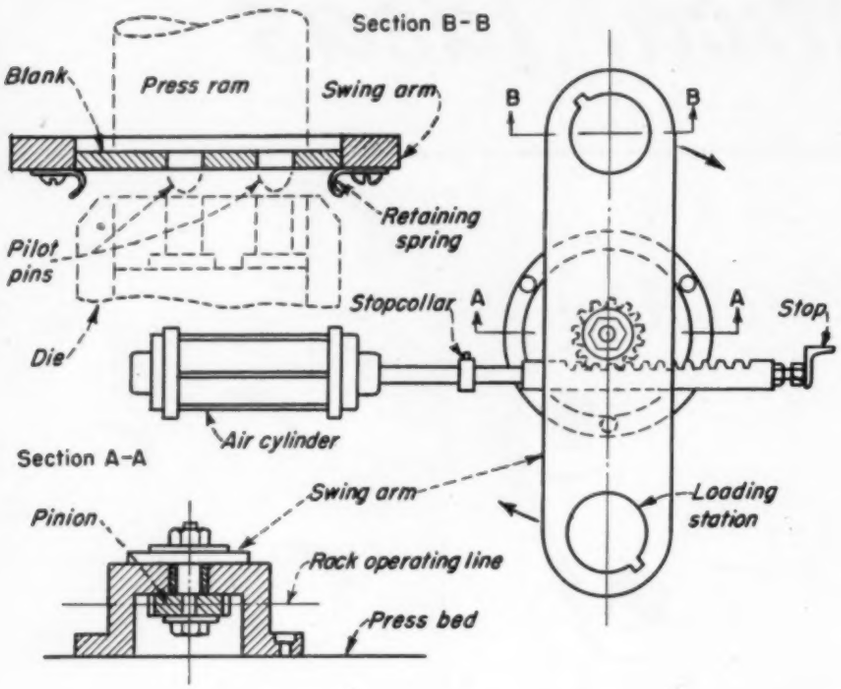
Button Holders Solve "Impossible" Layout Problems

Precision die layouts for lathe faceplate setups are usually made with the aid of toolmaker's buttons to eliminate all the many errors and the inherent lack of accuracy in scribed layouts. Usual procedure is to make a rough layout with a square and sharp scriber, drill and tap a small hole as nearly concentric as possible with each die hole to be bored and ground, then mount a toolmaker's button over each hole and secure with a washer and machine screw. One hole is first carefully located with reference to the sides of the die or any fixed element, and the others are located from it using blocks, shims, micrometers, etc. Once the buttons have been juggled into perfect position and securely held, the work is mounted on the faceplate and each button is centered with a dial indicator in turn. As each button is centered, it is removed and that hole bored out to size.

Aside from the tedious pains necessitated by this method, there are two additional limitations which have been overcome by the following modifications. Button-holding screws must be large enough to hold the button adequately and sometimes, the actual hole required will be smaller than this screw. Commercial buttons come in several sizes, but occasionally, the minimum standard button will be too large for the required inter-hole spacing.

Both of these restrictions have been lifted by using this finger-pin locator. It consists of a hardened and ground straight pin squarely mounted near the end of a piece of flat tool steel. The flat strip becomes the "handle" or holder and it allows clamping by any of several means without necessity for preliminary layouts or pilot holes. The slender pin is solid and naturally can be much smaller than a standard, hollow button. Setup adjustments are easier because it is not necessary to rap or jar the gaging surface as the bolts are finally drawn tight with the danger of damage or strain on the button itself. Also, as the holding devices can be very large in proportion to the size of the layout, much less stress is required, and even this will not be localized in the critical area with probable distortion.

Single-point bored holes are always considered the most accurate, of course, but jig-drilled holes are nearly as accurate and can be produced much faster (when you have the jig). Corollary to the finger-pin layout method is a bushing-button tool which facilitates the best in drillpress work. Here, the gaging pin is replaced by a drill bushing. The unit must be carefully checked after assembly to insure squareness and concentricity of the bushing with the gaging outside diameter. *Frederico Strasser, Santiago de Chile.*

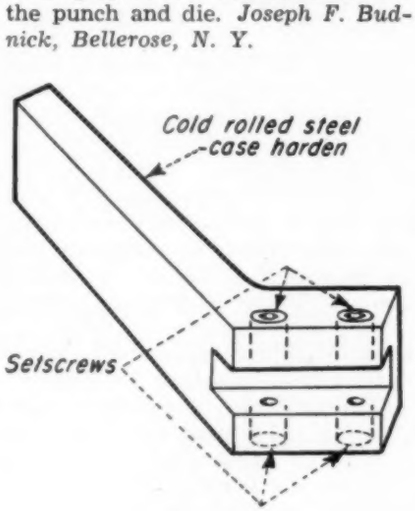


Tandem Press Loader Uses Air Cylinder

Most press operations require some kind of automatic loading arrangement because of the high speed, repetitive, low-cost nature of the work. Here's a fixture, a little different from most, which is applicable to many products not suitable for more conventional loading. It's especially suitable for many die-casting trimming operations, for example.

By employing the tandem principle, one station is always out well away from the dies where the operator can unload and reload while the other station is in working position. As the feed movement is intermittent and the direction of feed immaterial, an air cylinder was selected in preference to electrical or purely mechanical means because of its high speed and simple control.

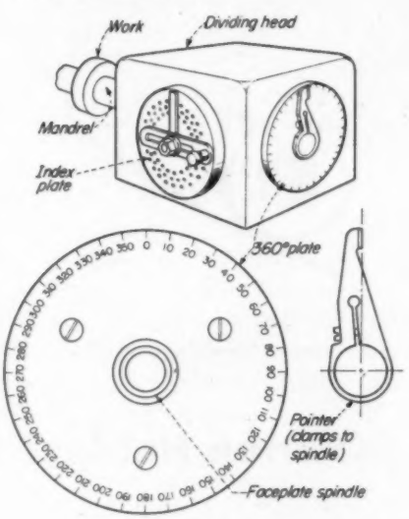
The loader itself is a beam which swings or oscillates in 180° arcs about a central pivot riding in a bronze bearing under the influence of a rack and pinion drive. The air cylinder is directly connected to the rack, and stops are provided to limit the stroke so the beam will stop in exact working position. Further, the press punch is fitted with suitable leaders to take up any looseness, making sure that no misalignment could occur. Rubber bumpers or other cushioning means should be employed in addition, to absorb the momentum near the end of each stroke, preventing impact and eventual damage to the moving parts. Automaticity can be achieved by synchronizing the air valve with the press controls so all the operator has to do is load and unload. There is no danger of personal injury because loading operations are nowhere near the punch and die. *Joseph F. Budnick, Bellerose, N. Y.*



Openside Toolholder Allows Closer Facing and Turning

Here's a lathe toolholder for both left- and right-hand turning (just turn it over; it's symmetrical.) which allows working right up to the chuck even with stubby toolbits because there is no side projection to interfere. This construction is far simpler, too, for it eliminates the square broached hole. The double setscrews provide as strong or stronger clamping than the "conventional" toolholder, and the two opposing screws are used only when the toolholder is turned over. That is, only the top two screws are used in any case.

This original model was made from ⅜ x ⅞-in. cold-rolled barstock, and provided with a 5/16-in. square tool slot. 10-32 Allen setscrews were used for clamping. Many more of these have already been made, and there is no reason why the proportions can not be altered to suit other requirements. *Arthur Morton, West Warwick, R. I.*



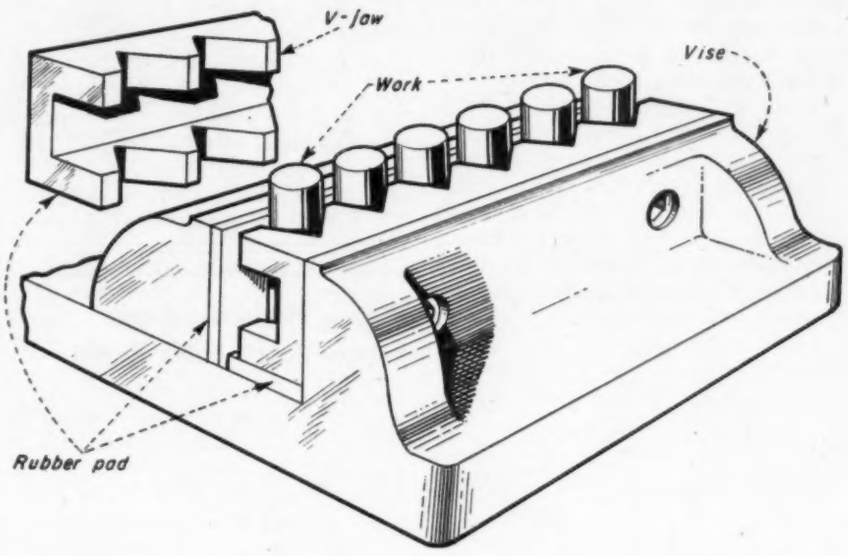
Azimuth Plate Rechecks Dividing

Complicated dividing-head operations can be confusing when several turns of the index plate produce only a small arc on the work itself, and no convenient method of counting turns is available. This pointer clamps to the rear end of the main spindle and has a scribed mark or knife-edge which corresponds to degree graduations on the gear-box cover plate, or a thin plate permanently attached thereto.

The pointer is made adjustable so it can be set to zero when work is properly chucked or dogged and operations are about to begin. *Fay E. Clarke, Claremont, N. H.*

Editor's Note: Compass cards and bearing indicators from aircraft, marine and artillery instruments, now available in surplus, are handy for use in various protractor, or angle-measuring devices.

Rubber Jaws Holds Many Pieces



Small barstock milling fixtures are very common and the problem of holding several pieces of nearly identical diameter comes up frequently. Usual split slots have not proved satisfactory because slight diameter variations prevent tight clamping so complicated devices are resorted to.

Here is an idea which has worked most successfully, but is almost simplicity itself. Locating is accomplished with a multiple V-block relieved longitudinally across the center of the vees. This is placed against one jaw of the vise and a plain flat piece of rubber or neoprene is placed on the opposite jaw. The resilience of the rubber provides plenty of latitude and no slipping was ever encountered although the specific job placed a heavy torque on the parts. *A. F. Scoblic, Milwaukee, Wisconsin.*

Sheet Metal Held Flat in Telescoping Vise Insert

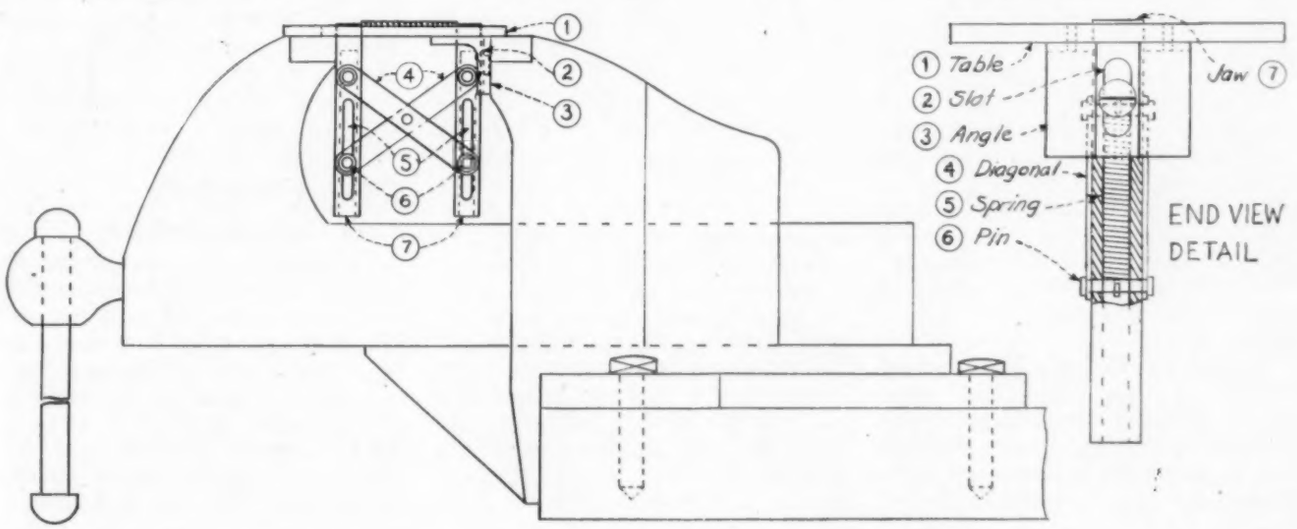
Accommodating thin-gage strip 0.025 x 2 in., this attachment makes a valuable addition to most shops for filing, scraping or polishing surfaces of thin pieces.

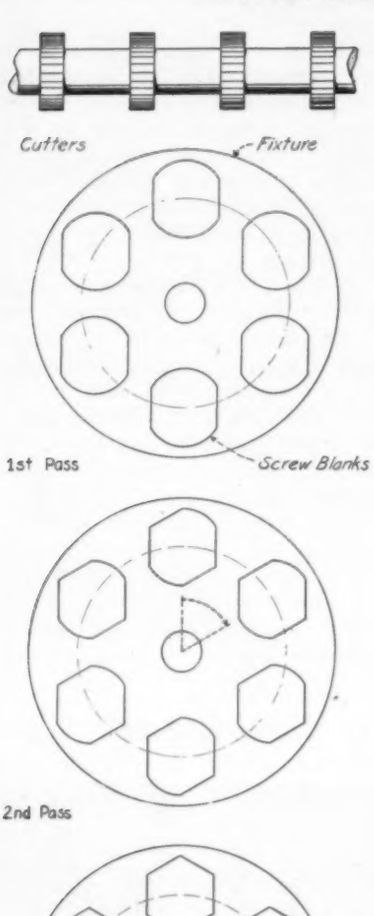
Jaws are a pair of square vertical bars, drilled out for coil springs. To one jaw is fastened a hardened and ground square angle and to this the table is secured. The table, or work-leveling plate, is ground flat to a size slightly larger than the bench-vise jaw width and the maximum gripping capacity.

The table rests on top of the bench-vise jaws at all times while the attachment pillar-jaws hang down inside the vise. These jaws are held parallel and against the bench-vise with diagonal scissors and coil springs which tend to keep the pillars fully spread. The pillars are provided with a slight vertical adjustment so they can be moved down almost flush with the table when extremely thin work is to be held. Ordinarily, they will project about ⅛ in., and ¼ in. is the normal maximum projection.

All screws, pins, etc. are recessed where required to clear the bench vise, and the attachment is fully automatic when in place because of the tension springs which pull the pillars against the vise jaws. *C. D. Mackinnon, Airdrie, Scotland.*

Pantograph spring parallels and an adjustable table permit surface operations on extremely-thin stock





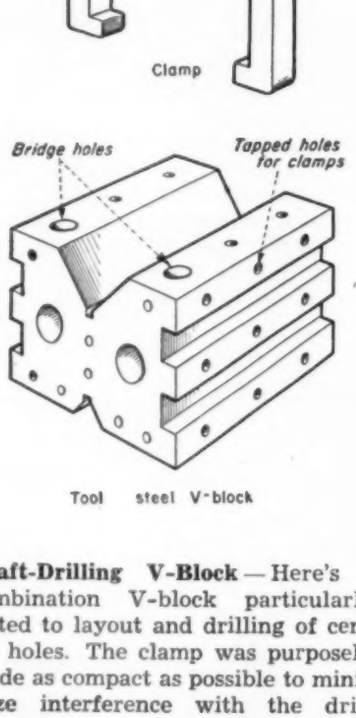
Six Hex-Heads Milled in Three Passes With Indexing Table

Hex-heading an unusual part has been speeded with the introduction of a six-station, 60° indexing table and ganged milling cutters. Work and cutters are so arranged that the first pass mills all pieces on both sides, removing a 60° segment on each side of each piece. The first index presents the work for the second pass which removes the adjacent 60° segments, and the second index and third pass completes six perfect hexagons.

Details of the setup are a matter of personal preference and equipment available. This setup is intended as schematic and is subject to considerable modification. Adjustability of cutters should be provided to allow for regrinding, so two more intermediate cutters, or adjustable-blade cutters would normally be used.

The same work could perhaps be done faster on a shaper using a suitable multiple toolholder.

Fixture design is standard. The rotating member carries the work with provision for locking pieces in place quickly, and has six indexing holes. The indexing pin is mounted on the base and is properly bushed and has a spring under its shoulder to hold it in until pulled. *Robert Mawson, Providence, R. I.*



Shaft-Drilling V-Block — Here's a combination V-block particularly suited to layout and drilling of center holes. The clamp was purposely made as compact as possible to minimize interference with the drill chuck, and it was left unhardened because of the possibility of heat distortion, and misalignment of the drilling bushing. *Gosta Mattson, Bronx, N. Y.*

Milling Machine Column Pointer Resets Table Height

A piece of slotted channel bolted vertically along on side of a milling machine column and fitted with an adjustable pointer provides a convenient way to re-establish a frequently-used knee position. Matching the pointer is a small polished or white-painted block carrying a hair line. This adjustment makes returning to position much faster by cutting out the necessity for frequent checking with other tools. *J. Cuyler, Pelham, N. Y*

Thin web
Drill Point Detail
Operation 1- Counter bore and spot-drill
Operation 2- Drill body hole following spotted center

Old Short Twist Drills Make Good Counterbores

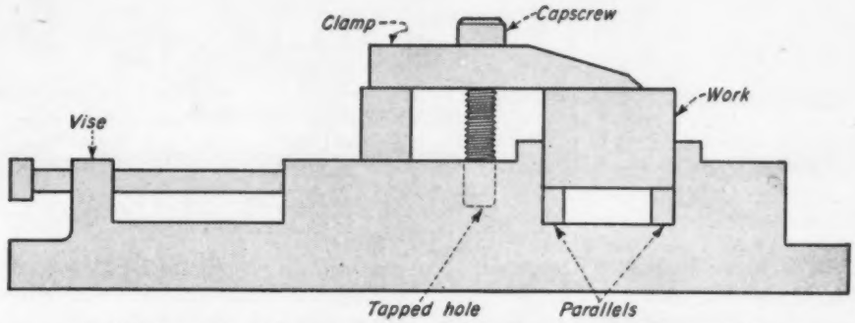
Small shops lacking a complete set of counterbores sometimes drill the hole, then grind the drill flat and square the shoulder with the same tool. This is waste of time and drills.

Reversing the usual counterboring sequence gives a very fast and efficient way of counterboring for fillister-type screws and no piloting is required. An old drill ground

square at the periphery but with a small point left at the center with the web well thinned, of course, will cut the large hole in one operation and provide a centered spot for the body drill which follows.

This idea can also be used on turret lathes or screw machines where the part requires stepped holes of various kinds. It simplifies the setup in many cases and eliminates boring. *Raymond K. Stryker, Trenton, N. J.*

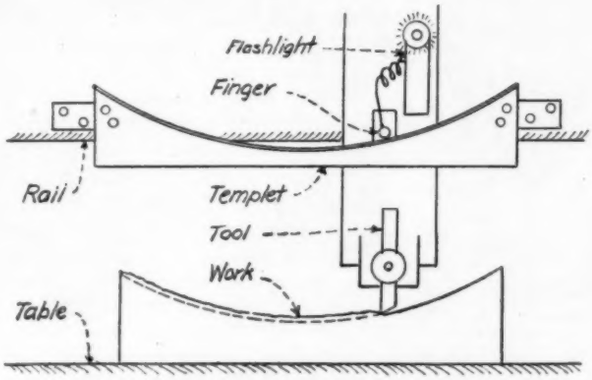
Eye Calisthenics are just as necessary as any other kind of muscular exercise according to Dr. P. Bisceglia, prominent eye specialist. A lot of close work stretches eye muscles into abnormal position, and this strain should be relieved by glancing at some far away scene at intervals. *Henry S. Galus, New Bedford, Mass.*



Auxiliary Vise Clamp Prevents Slipping During Heavy Cuts

Raising work on parallels in a machine vise to expose more surface reduces the clamping area and increases the danger of slipping. When work must be raised for some special cut until the gripping surface is dangerously small, I have found it helpful to install half a toolmaker's clamp or the equivalent on the top of the vise, holding work and parallels firmly against the bottom of the vise.

An ordinary machine hold-down or crab will serve or special ones can be made when clearance is critical. *Nels A. Malmgren, Chicago, Ill.*



Light Shows Follower Contact

Templet and follower profile tracing is fine if you can stay close enough to the pointer to observe actual contact. On larger jobs, this may be impossible. This difficulty was solved on a fairly large planing job, by electrifying the setup, making the templet and follower into the poles of a flashlight off-on switch.

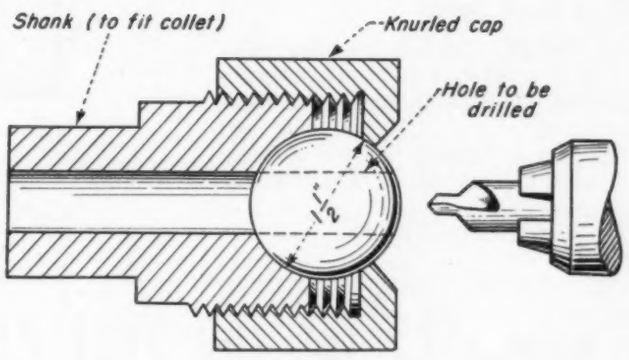
After work is roughed to approximate shape, the rail and tool slide, and the tool itself are adjusted for the start of the finish cut. Then, the sheet-metal templet, mounted on insulating blocks is carefully adjusted on the rail so its profile exactly corresponds with that of the work, and so the drillrod pointer, fastened in the tool slide just touches the templet. A flashlight battery and bulb, or an altered flashlight is mounted on the tool slide with the switch disconnected. Bell-wire leads are run to the drillrod and to the templet. The bulb should then light.

When the planer is started, the power cross feed carries the tool horizontally, and the pointer will come away from the templet. The operator then immediately moves the tool slide down by hand until the bulb just lights again, and this process is repeated until the bottom of the arc is reached.

With this method, cutting should be "downhill" for accuracy. Complicated profiles should be cut in two steps, each performing all the downward cuts in that particular direction of feed.

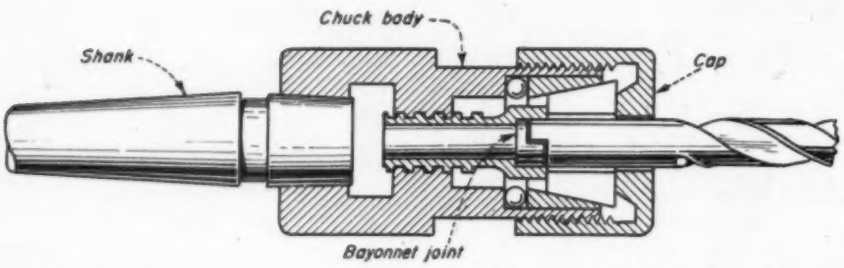
Many modifications of this are possible. If sensitivity is important, a double contact arrangement can be made where the first contact lights one bulb, showing minimum contact, and another contact, slightly behind the first, lights a second bulb when the first contact finger is distorted a predetermined amount. *Earl Goodman, Phoenix, Arizona.*

Lathe Chuck Holds Balls



Vise handles, machine handles of various kinds, swivel, ball and socket joints, etc., all use balls which must be provided with a shaft or stud. Rather than turn these from barstock for each job, we salvage steel balls from old bearings, anneal them and drill them as required. Ordinarily, a ball is rather awkward to hold, and equally hard to drill on dead center, but this simple chuck has solved the problem neatly.

The ball-holding chuck can be machined from ordinary stock with a shank to fit any standard collet, or to screw over the spindle nose. By modifying the design slightly, ordinary pipe fittings could be used and only a minimum of machining would be required to true up the parts accurately. The body could be turned from a piece of double extra heavy pipe, and the cap made from a standard pipe cap. *L. H. Hardcastle, Port Arthur, Texas.*

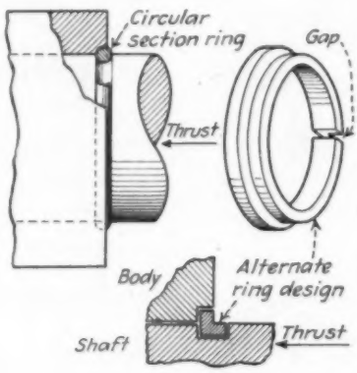


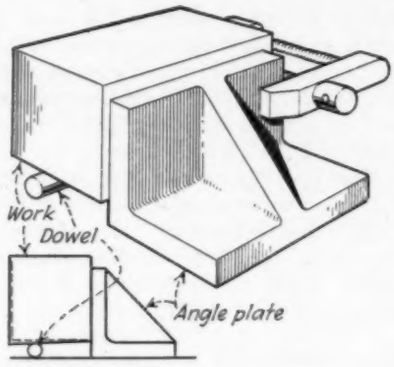
Bayonet Chuck—Any drill chuck can be provided with a positive drive, eliminating the destruction and annoyance of slipping drills by installing a step in the bottom of the drill seat. This step does not interfere with regular use of the chuck, but any drills whose shanks have been ground flat to the diameter for a short distance will seat against the flat in the chuck, and when tightened in the usual manner, will never slip. *Henry G. Berndt, Horicon, Wis.*

Small Thrust Collars Save Shaft Space

Snap rings of plain round wire work well as shaft collars in many applications. The shaft requires a half-round groove of wire diameter, and the part to be held is given a counterbore to take the other half of the projecting wire ring to either half its longitudinal depth, or deep enough to hide it entirely when space close to the hub is important.

When the component is hardened and can't be machined conveniently, a ball bearing for instance, the alternate type of ring can be used. This is machined up and split, and is made to fit into a very shallow groove in the shaft. *Martin H. Ball, Watervliet, N. Y.*





Magnetic chuck

Dowel Aids Square Grinding

Magnetically chucking pieces for finish-grinding operations when precision squaring is being done, in particular, requires use of an angle plate. But if the part is slightly off-square, the chuck will pull the work down against its surface in spite of the fastenings to the angle plate. (The angle plate will probably tip.)

Dowel pins at each end of the piece near the edge away from the angle plate support the overhang and make a solid connection with the chuck. This makes setting up easier and permits heavier grinds, when necessary, and assures faster and more accurate work. *Howard De Heer, Grand Haven, Mich.*

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Forty-second Selection—W. H. McCullough's Multiple Drilling Attachment

NEWS OF METALWORKING

U. S., Britain Cut German Machine Tool Output to $68 Million Yearly

WASHINGTON—The value of German machine tool output in the British and U.S. bi-zonal areas has been set by occupation authorities at 63% of the present capacity, or 49% of prewar production.

Present yearly capacity is estimated at $108 million, compared with the 1936 level of $144 million. Under the bi-zonal ruling, the industry will be limited to a $68-million schedule.

Stabilization at this figure will be accomplished through the removal of 25 machine tool plants in the form of reparations.

Damage from Allied bombing to machine tool plant capacity was light, resulting only from chance hits during area bombing raids and spill-overs from other target concentrations. Production figures show that the drop in the total annual value of German machine tool production was $53.4 million from 1939 to 1944. This is attributed to lack of demand rather than war damage.

Information from areas other than the British and American zones is spotty and unreliable. In the Soviet zone, there are three major concentrations of machine tool plants —in Leipzig, Chemnitz and Berlin. Beyond this little information is available except through refugees from the Soviet zone. All their statements indicate that the plants not already removed to the USSR are being pushed to their absolute production limit.

Production figures from France, though not available, could not be very significant. In the Allied partitioning of Germany the amount of machinery and optics industries in the French zone amounted to only 7% of prewar Germany's total available plants in those categories.

Dr. Slepian Wins Electrical Medal

PITTSBURGH—Dr. Joseph Slepian, associate director of Westinghouse Research Laboratories, will be awarded the Edison Medal for 1947 for meritorious achievement in electrical science by the American Institute of Electrical Engineers during the Winter convention here Jan. 26-30.

Dr. Slepian developed the ignitron, an electronic tube now widely used in the production of aluminum and magnesium and did outstanding pioneer work in the design of circuit breakers and lightning arresters for protection of power systems.

Crashing Down between these 40-foot steel towers, an airplane landing gear is tested in the Lockheed Aircraft Corp. research laboratory's newest machine. The wheels are spun backward before they are dropped. When they hit the concrete base, smoke from skidding tires which can be seen for a few seconds is caught by the camera. Tons of lead weight, seen above the gears, are equal to half the weight of the plane which the gear would support

India Brass Industry Strong

BOMBAY, INDIA — India has attained self-sufficiency in copper and brass alloys, rods and bars and soon will be able to meet her requirements for sheets and strips, according to a survey made by the Indian Non-Ferrous Metals Manufacturers Association.

The self-sufficiency is confined to the semi-manufactures, however, since almost all of the virgin metals still must be imported.

Pending careful study of the country's mineral resources, the association is urging the government to approve the establishment of refineries based on imported scrap metals, as was done in Great Britain.

Admiral Hussey Takes ASA Post

NEW YORK—Vice Admiral George F. Hussey, Jr., USN (Ret.), war time chief of the Navy's Bureau of Ordnance, assumed the duties as administrative head of the American Standards Association Jan. 1.

In this capacity, Admiral Hussey will direct the cooperative efforts of industry, consumers and government in the problem of standardization. Cyril Ainsworth, who for a number of years has been in charge of the technical activities of the ASA, will serve with the admiral as director of operations of the staff.

Admiral Hussey started his Navy career in 1912 with an appointment to the Naval Academy and has served in many capacities requiring the highest order of skill and ability. Specializing in ballistics, he advanced in grade and responsibility to the position of chief of the Bureau of Ordnance. For his service in this capacity he was awarded the Distinguished Service Medal.

In accepting the appointment, Admiral Hussey will take over the tremendously increased administrative responsibilities from Dr. P. G. Agnew, under whose direction the ASA has progressed to its present high level. Dr. Agnew, one of the foremost authorities on standardization, will continue as consultant.

The ASA expects to increase its activities during the next year to approximately three times that of the largest year before the war.

Russian Industrial Claims

(McGRAW-HILL WORLD NEWS)

Reemerging from war ruins inflicted during the three-year German blockade, Leningrad industry has regained its leading position as a center of advanced Soviet machine-building and has become the standard bearer in the national drive for completion of the current 5-year plan before 1950.

The restored Leningrad industry is said to have completed 1947 output goals two months and eight days ahead of schedule and attained a gross output 24% above that of 1946 with scores of plants surpassing prewar levels in productivity of labor.

Marking the success attained by industry in Leningrad, the Soviet press described major items of new equipment:

Electrical—A series of high-pressure steam turbines of 50,000 to 100,000 kw. capacity, including turbo-generators of 100,000 kw. with Soviet-designed hydrogen-cooling are being produced at the Electrosila plant, which has also produced a hydro-generator of 70,000 kw. capacity, weighing 1,250 tons. Output at this plant has reached prewar levels.

A hydro-turbine of 103,000 hp. has been produced for the Dnieper power station. Six powerful hydro-turbine driving wheels were also made for the Dnieper station. At the Metallist factory each driving wheel was cast in one piece, instead of two sections. Stated to be an advance over American turbine construction technique, the one-piece casting method resulted in a saving of 2.5 million rubles for the six wheels and reduced installation time per wheel to three months.

The 37,500 kw. hydro-turbine being produced in Leningrad has an efficiency factor of 0.93, stated to surpass that of similar American-type turbines.

The factory named after Lenin has in production a turbo-air blower with a capacity of 70,600 cu. ft. per minute. This same factory for the first time in Russia has produced a stationary gas turbine operating on liquid fuel.

Machine Tools—The latest types of machine tools being produced include an automatic copy milling machine for making details of complicated configuration, boring mills, automatic and semi-automatic lathes, and diverse special machine tools for various branches of the machine building industry.

In shop practice new methods have been applied to increase productivity. Application of a vortex process in cutting threads in the block of a pump increased productivity six to eight times. A self-spreader installed in the wrapping machines at a confectionary plant resulted in halving of the service personnel. Use of machine calibration of glass slips in radio tubes, instead of hand calibration, made it possible to carry out this operation with two workers instead of sixteen at the Svetlana radio equipment plant. Automatic grid-packing machines have been produced and installed for the first time. Each automatic machine replaces 20 skilled workers.

Scientific Instruments—The Leningrad instrument factories have in production seismic apparatus, television sets, vertical and horizontal comparators, polarization and electronic microscopes, improved motion picture cameras, modern design radio receivers, oscillographs, pyrometric instruments, gas-analyzers and new-type vacuum devices.

Seamless steel wheels for Russia's battered railway carriers are now being produced at the country's largest wheel rolling mill at Dnepropetrovsk. The preprocessing, press rolling and tempering shops that make up the mill are the first sections of the Karl Liebknecht metallurgical plant to be restored after German destruction.

Russia's largest agricultural machinery plant at Rostov has again taken its place as the country's leading producer of mechanized farm equipment. Completely devastated by the war, the plant was working on its second thousand Stalinets-6 tractors this November on its way back to prewar production levels. The 1948 schedule is triple the current output.

A pipe-threading head that weighs half a ton and consists of 500 parts has been produced for the Soviet oil industry by the Moscow Instrument factory, a major producer of instruments and machine tools for aircraft, automobile, locomotive and engine works.

Serial production of a new model port loading machine of three-ton lift, resembling an auto towing unit, has been launched at the Kherson Port Equipment factory of the Soviet Merchant Marine Ministry. Depending on haulage distance, the new loader can handle 30 to 100 tons per hour.

A highly productive automatic machine tool for sharpening shear blades of harvesting machines has been developed by a team of four Russian engineers at the Moscow Grinding-Machine factory. The rated capacity of the new Soviet machine is stated to be 1632 blades per hour.

Three-Speed Clutch, operated by foot, is shown on Harley-Davidson Motor Co.'s model 125, single-cylinder motorcycle. William J. Harley, chief engineer, is shown explaining the clutch to (left to right) Gordon M. Davidson, vice president; Arthur Davidson, general sales manager; William H. Davidson, pres.

Auto Industry in Germany at Lowest Point

ZURICH — (McGraw-Hill World News)—In an anlysis of the German automotive industry which appeared recently in the "Neue Zuercher Zeitung," an interesting comparison was made between the situation as it is today and as it was in 1938.

Before the war, as is well-known, Germany had factories for all kinds of automobiles, makes that were known for high-quality technical performances the world over. Today, the same auto industry is completely on the ground. The works in Soviet Russia have been disassembled and the productive capacity in the Western zones is very poor.

Scarcity of Labor

The reasons for this condition are the same as those present in every other German industry, namely shortage of materials and energy, scarcity of labor, decrease of labor's productivity, need of repairs in the works and so forth.

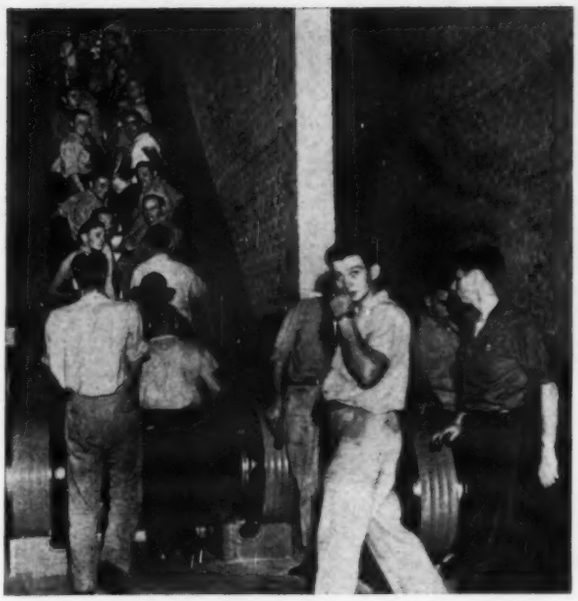
A new revised industrial plan now calls for a productive capacity of 160,000 cars and 61,500 trucks. However, the article points out that it is practically impossible to set down a production program for the future when its fulfillment depends on a mass of presumptions and when the market possibilities are unknown. Only after a reorganization of the currency situation and the publication of final peace conditions can a coordination of the industry with the living standard be possible.

10 Years Away from Standard

On July 1, 1938, there were 1,272,000 cars in Germany, with the ratio of 1 out of every 56 inhabitants owning a car. The average for the whole of Europe was 1 in 78. That prewar standard will take at least 10 years or more to be reached again, as estimated by a capacity production figure set now at 160,000 when the pre-war production figure ran to 270,000 cars a year. In the first half of 1947, production in the British zone decreased as compared with the same period of 1946.

Dr. Brode Appointed

WASHINGTON—Dr. Wallace Reed Brode, internationally known chemist, has been appointed associate director of the National Bureau of Standards, Dr. E. U. Condon, director, has announced. He succeeds Dr. Hugh L. Dryden, who was recently named director of aeronautical research of the National Advisory Committee for Aeronautics.



Escalators Move Into Big Factories for the first time with this installation at the new Buick stamping plant, Flint, Mich. There are five flights, each with a capacity of 6,000 persons an hour, running between the first, second and third floors. The direction of movement is up or down as shift requirements dictate

Human Element Important to Output, AMA Production Conference is Told

NEW YORK—Modern materials handling equipment, careful plant layout, efficient purchasing, incentive systems and an intelligent understanding of the human element were stressed, at the two-day Production Conference of the American Management Association at the Hotel Pennsylvania, as integral parts of producing in mass quantities.

Production men "should know as much about the basic problems of industrial relations policies and techniques as they know about plant layout or tool design or the control of non-productive costs," Peter F. Drucker, economist at Bennington College, warned almost 1,000 attending the conference. "Only the closest cooperation between production and personnel men can solve the most important problem our American industrial system faces: the increasing lack of mutual understanding of 'communication' between management and workers," he asserted.

On the national economy side, Sumner H. Slichter, Lamont professor at Harvard University, told the conference that a recession in 1948 did not appear likely.

He explained that "inventories are small in relation to sales and the accumulation of inventories does not seem to be going on rapidly. Hence, a drop in the rate of inventory accumulation is not likely to precipitate a recession."

During other sessions, C. G. Frantz, president of Apex Electrical Mfg. Co., Cleveland, Ohio, told how the Cleveland Plant Incentive Plan, during the period it has been in effect, has increased measured average efficiency from a low of less than 50% to an output of 200% of standards. Under this plan, he said, the management agrees that there shall be no limitation on earnings, earnings shall be calculated daily, and established standards are guaranteed unless there is a change of equipment, methods or work requirement.

The group production bonus plan under which production has increased with no increase in the work force at the Wolverine Tube Division, Calumet & Hecla Consolidated Copper Co., was explained by D. D. Decker, director of industrial relations.

He cited output of 156.3 pounds per man hour last October, compared with the December, 1945, base of 100, as an indication of the scope of the improvement.

MAPI Holds Third Study Conference on Economics

WASHINGTON—More than 150 industrial executives gathered at the Mayflower Hotel to participate in a unique adult education project originated by William J. Kelly, president of the Machinery and Allied Products Institute.

For some of the businessmen it was the third year of study at the Conference in Capital Good Economics under Dr. George Terborgh, the institute's director of research. Although no diplomas or degrees are given, each businessman-student gets the equivalent of a year's course in economics of graduate student caliber in a university.

The session was devoted largely to government-industry relations.

Gaging Business

More Steel Tonnage Looms

The mad scramble for steel, especially flat-rolled, continues. And the gray market appears more flourishing than ever.

▸ Though there is much wailing over the possibility that domestic users will not get all the steel they want in 1948, chances are that the tonnage will be larger than this year.

▸ One of the difficulties will be to get your share. Because of high freight rates and extension of mill basing points, many mills are withdrawing from distant markets and are selling all of their tonnage close at home. This is fine for users nearby, but tough for those on the fringes.

Brass Mills Expanding Output

Brass companies are prepared to step up output of flat metal, rods and tubes. Business has perked up again after having gone through a period of receding demand.

▸ Several mills are scheduling operations on Fridays and Saturdays of the two holiday weeks. An upswing in orders accounted for this action.

Pig Iron Gets Tighter

Pig iron again is a source of worry. It is getting tighter in some sections of the country, including New England. Example: one metalworking company in Connecticut has lost one (in the South) of its three sources of supply and is unable to make up the lost tonnage from the other two. The situation is duplicated in many cities.

Drop Forge Business Good

Drop forge shops are closing the year with total business not far from the figure estimated as the goal early in 1947. They would have achieved their goal completely if enough materials had been available. The industry's backlog is equal to a comfortable six months of business.

▸ Stamping press builders are doing all right. They have lots of orders from the automotive field, as well as from other users. They anticipate a good year in '48.

Die Shops Report Upswing

New England tool and die shops report an upswing the last two months. The improvement is particularly noted in highly-specialized die shops. Straight jig-and-fixture plants, many of which appeared during the war, are feeling severely the tendency of many manufacturers to make simple tools and dies in their own toolrooms, contracting outside for only the more difficult jobs.

Refrigerator Output Curtailed

Steel will be the limiting factor in electric refrigerator output next year. One of the large producers expects to operate at only 80% of capacity during '48 because of steel shortage. If much steel is exported to Europe, refrigerator units assembled will be even less. Despite the steel bottleneck, it appears likely that a buyer's market will be reached by midyear.

Liliput Lubrication—Josephine Trombetta, making Schick Electric Shavers at Stamford, Conn., inserts half-inch oil wick to lubricate what is said to be the smallest motor now in large production

Ranges in Heavy Demand

Electric ranges are in top demand. So are automatic dish-washing units and disposal units. Table-model radio sets are being made in such high volume that the retail trade cannot absorb them. Electric clock production continues to break records. Electric hot-water heaters should do well in the months ahead.

Long Deliveries for Turbines

Large electric turbines still hold the spotlight as the item with the longest deliveries. Manufacturers are quoting 1950 and 1951. Fractional horsepower motors have finally reached the stage at which some sellers are soliciting new business. The situation by no means is easy, but the critical condition which existed so long is beginning to fade. In the larger sizes, motors bear the blame for delays in assemblies of several metalworking products, including large machine tools.

Machine Tool Sales at Good Level

Machine tool sales stayed at a good level through Deeember. No figures are yet available dollarwise, but they are not expected to show much of a drop from the 19.5 million of new orders booked in November.

▸ A larger percentage of new business has been coming from domestic customers during recent weeks than earlier in the year. The great diversity of orders indicates a strong, healthy situation in the machine tool industry. Current sales originate in a wide variety of metalworking lines rather than in a few, and individual transactions are for from one to three or four machines.

Shipments Total $300 Million

November shipments for the entire machine tool industry totaled about $24.5 million, as against $27.5 million in October. It is estimated that the year's production will just barely hit $300 million, the amount predicted previously by AMERICAN MACHINIST.

▸ Unfilled orders for machine tools now add up to $110.1 million, a modest decline from $113.6 million the preceding month.

Export Orders Decline

Export sales of machine tools dipped sharply in November compared with October. Prospective orders abroad continue to pile up awaiting the possibility of import license grants. One U. S. builder's agent in France has $1 million of such orders on hand. Whether licenses will come through at all is anyone's guess. The volume of production for Russia and the number of Soviet inquiries are very small.

Detroit

STABLE AUTOMOTIVE PRODUCTION IN 1948 PREDICTED...FEW SHUTDOWNS EXPECTED...EXPORTS EQUAL FIGURES FOR 1946

The new year begins with fairly stable automotive production anticipated. Some of the work-weeks in December saw the industry complete upwards of 116,000 vehicles per week, highest level since VJ-Day; and January can be expected to reach close to these levels.

Oldsmobile and Buick will probably be closed for short periods during January for changeovers, and Pontiac may be down for a scant few days also, but otherwise such closings immediately ahead are virtually non-existent. Output will be aided by resumption of manufacturing of Ford trucks, which did not move during late November and early December due to a shift to 1948 models.

Studebaker and Hudson have amplified hopes for enlarged volume, due to acquisitions of sheet steel rolling mills. Studebaker bought the facilities of Empire Steel Corp., and Hudson leased the one-time Shanango tinplate facility of Carnegie-Illinois, New Castle, Pa.

Steel Relief Not Expected

The moves of these companies make it apparent that no one in the industry expects steel relief during the ensuing 12 months. Otherwise, the expenditure of important sums of money for facilities which are admittedly in the high-cost bracket would not be justified.

One of the bright phases of automobile production during 1947, which will be considerably dimmed in 1948, is the export picture. During the year just closed, shipments of cars and trucks abroad (including Canada) totaled approximately 11% of all output, equivalent to the 1946 mark, and better than most prewar showings.

The day of the high power reciprocating engine for military use has ended. That was signalled quite dramatically when the Allison Div. of General Motors Corp. announced the completion of the run on V-1710 liquid-cooled powerplants, which were specified for a number of the pursuit aircraft of World War II.

Air Force officers say that the reciprocating engine is being superseded, as raipdly as new types of planes can be brought into service, by various jet and turbine powerplants.

New Military Problems

This brings to mind, incidentally, that a speech by Gen. George C. Kenney in Detroit earlier this month made it clear that the military have brand-new problems of development and production at hand, as result of the obsoleting so many World War II weapons. As a typical example, Gen. Kenney reported the need for new designs of bombs which would drop with aerodynamic trueness from aircraft moving in the sonic speed ranges.

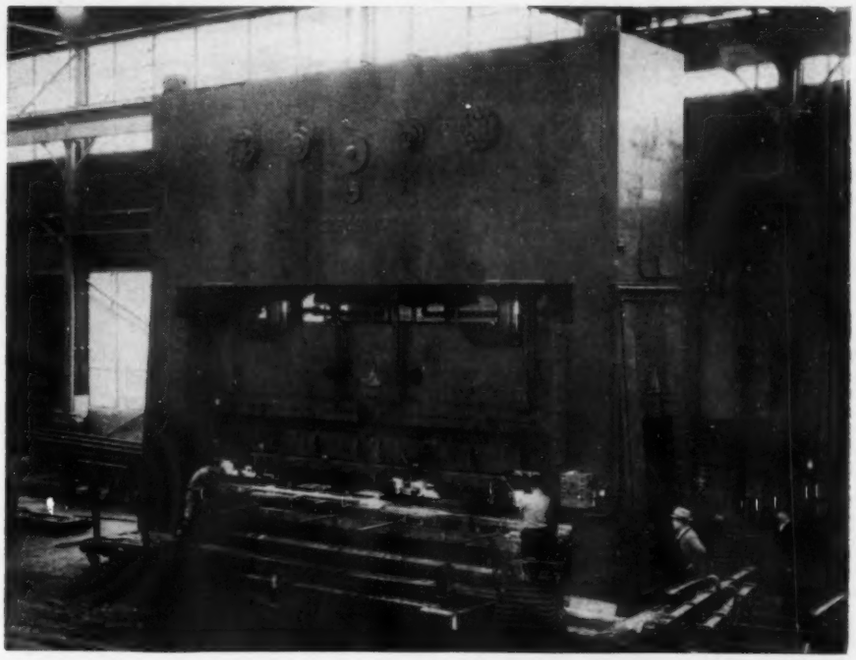
Reports out of Wright Field (echoed in lesser degree from other service arm development centers) are that numerous development contracts in a wide variety of classifications continue to be placed. The wartime alliance of the services and industry is continuing

Plant expansions are definitely in the industrial news. Here are a variety of announcements of the past few weeks, all with the common denominator of producing automotive products better and cheaper:

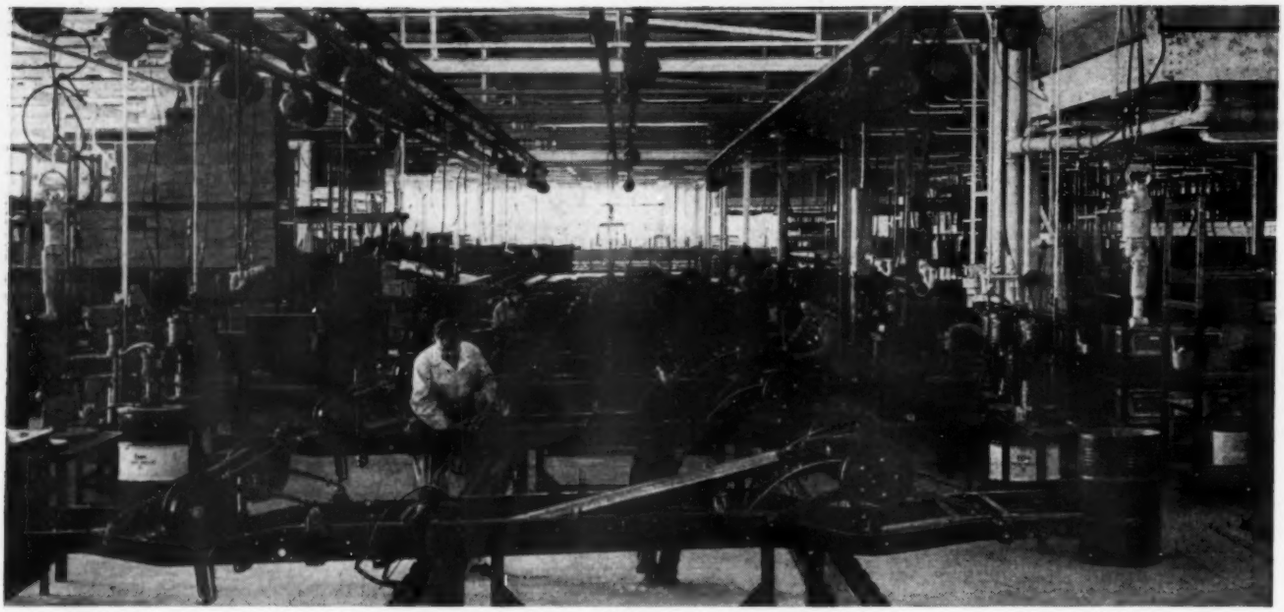
Ford has brought into production its new car and truck assembly plant at Hapeville, Ga., near Atlanta. This plant will have capacity of 350 vehicles per day, a payroll of about 2.000. Cost was $7-million, of which about $1-million was for tooling, largely in conveyorizing and other assembly factory requirements.

Buick completed its huge postwar reconstruction and expansion program at Flint, involving 2 million feet of floor space and 17 new buildings, largest of which was a sheet stamping plant. The new facilities give Buick an output potential of more than a half million cars a year, about 50% up from previous levels. This capacity rating is close enough to that of Plymouth to stir up speculation in Detroit whether Buick — a make of car considerably in demand, good times or bad — can overtake Plymouth and win the coveted third place in the industry.

Kaiser-Frazer is responsible for a $2-million expansion at Kaiser-Fleetwings, Inc., Bristol, Pa., now being begun. The installations outlined include 22 draw presses, some of 750-ton capacity, two hemming presses and 12 welding presses, as well as numerous other pieces.



Single Stroke of this big Clearing press stamps outside rails for frames of the largest busses, trucks and trailers at the Cleveland plant of Midland Steel Products Co. Pressure equal to the weight of 15 railroad freight engines is exerted. The press is sunk 15 feet below floor level and rises 44 feet above. A crew of four is required. At the right, E. J. Kulas, president, presses the starting button as W.F.B. Henderson, executive vice president, Clearing Machine Corp., Chicago, watches



Truck Chassis Conveyor in the new $10-million Ford Motor Co. assembly plant at Hapeville, Ga. was recently opened. The plant has 596,000 square feet of floor space and is located on an 82-acre plot. At full operation 350 cars and trucks will roll daily

Weekly Steel Production Records Reflect New Facilities of 1947

PITTSBURGH—New weekly production records in steel, as the year drew to a close, tended to become recognized as reflecting new facilities which have come in during the latter part of 1947.

In the face of shutdowns at some furnaces where repairs are necessary, the ingot output level has climbed. Production is computed against the Jan. 1, 1947, capacity level. This will be reestablished late in January on the basis of the start of a new year, and then the percentage rate of output will decline somewhat.

The 1947-48 goal of the steel industry is an addition of 4½ tons of new ingot capacity, but it is impossible to predict that all of this will be completed during 1948.

Should there be an accelerated amortization law passed by Congress, the expansion program will be quickened, but actual increases will depend on availability of materials.

Should there be no accelerated amortization act, ingot capacity expansion will proceed on a basis of whether it will pay the respective companies.

However, industry is increasing the pressure on steel producers for increased quotas in 1948. If, and when, the Marshall Plan is approved this pressure will be increased considerably if the foreign aid program takes additional steel from fabricators. Freight-car builders are also demanding additional stock.

There is no question about steel demand in 1948. It will remain strong all year. There will be soft spots in the steel structure all during the year and some products will be intermittently strong and easy. Alloy steels have a clouded outlook because of the apparent over-capacity of the industry.

Prices are likely to become stabilized. Some part of higher costs, if they develop, might be absorbed. No one can predict what the outcome may be of a movement to obtain "third-round" wage increases.

The industry is agog over Studebaker's and Hudson's entry into steel production. These must be considered emergency investments. The steel industry has no fears of them becoming contenders in the steel market when salesmen have to go out and look for orders.

What is most interesting at this time is whether any other important consumers will acquire steel-making facilities. There are constant reports of small steel companies being for sale or negotiated for.

Exposition April 5-8

ATLANTA—The third Southern Machinery and Metals Exposition will be held in the Atlanta, Ga., municipal auditorium, April 5-8. Michael F. Wiedl, Jr., managing director, 267 Paces Ferry Road, N.E., Atlanta, Ga.

Patents Freed

CLEVELAND—As a gesture of good will to the metalworking industry, the Cleveland Twist Drill Co. has made public five of its patents covering tools embodying hard non-ferrous metal inserts such as may be formed of tungsten carbide.

The following patents were freed: Re. 19,182, Drill and Like Instrument and Method of Making Same; 1,887,372, Cutting and Forming Tools; 1,887,373, Reamers and the Like; 1,887,374, Drill; 1,977,845, Cutting and Forming Tools, Implements and the Like, and Method of Making Same.

NMTBA, Auto Men Study Standards

CLEVELAND—Standardization of hydraulic elements going into machine tools was discussed in another of a serious of meetings between a committee of engineers from the National Machine Tool Builders Association and a committee representing the automobile industry in Detroit recently.

The program is being conducted along the same lines employed by the NMTBA in securing standardized electrical components from the electrical manufacturers for machine tools several months ago.

The next meeting is scheduled in January.

NTDMA Against Proposed Change On Overtime Pay

WASHINGTON — Three industries, heavy users of metalworking machinery, are against the proposed amendment of the United Electrical, Radio and Machine Workers, CIO, to raise to $500 the salary requirement exempting employees from overtime. Though some sentiment for changes in regulations regarding supervisory and administrative employees has been manifest in management's testimony at the current hearings before the wage hour administrator, opposition to the specific changes under consideration is general.

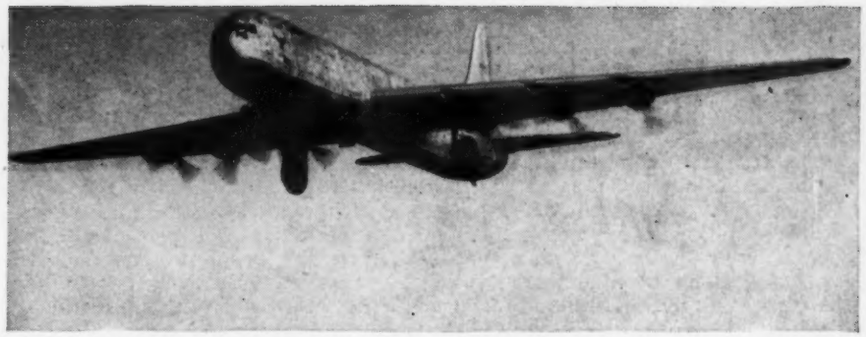
George S. Eaton, representing the National Tool and Die Manufacturers Association, furthering the cause of small plants, not only testified against any hike in the salary overtime cut-off limit, but said there were many arguments for having no monetary limit at all, rather than relying solely on the definitions of supervisory and administrative employees as laid down by the administrator.

Cites Rise in Costs

Lloyd B. Gruman, speaking for the Heating, Piping and Conditioning Contractors Association, added another voice to the plea by small industry. He flatly opposed the $500 amendment, emphasizing that it would, if adopted, hamstring the organizations he represents by raising accounting as well as other costs far above safe operating limits.

The Institute of Cooking and Heating Appliance Manufacturers, represented by Samuel Dunkel, contended that there was no reason for raising the exempt limit. He urged rather that exemptions be made according to present definitions of exempt occupations.

On the labor side, the Internatioanl Brotherhood of Electrical Workers, AFL, through Lawson Wimberly, assistant to Pres. Dan W. Tracy, suggested there be no changes in the present regulations except to raise the salary requirements to $100 a week. Joseph Dermody, international representative of UE-CIO called for a $500 salary standard as well as clarifying changes in the regulations. As a justification for his union's request, he cited the Heller Committee for Research in Social Economics, University of California, whose most recent report when adjusted to September, 1947, sets the annual budget of the white-collar family of four at $5234. He further urged that the processes of appeal be expedited.



Largest Land Plane, the XC-99 troop, cargo and hospital transport built for the Air Force by Consolidated Vultee Aircraft Corp., San Diego, has successfully completed its first test flight out of Lindbergh Field. The plane is of the same general design as Consolidated's B-36 bomber and can carry 400 fully-equipped troops. It has six engines mounted in the trailing. When gas turbine power plants are available, commercial airlines have indicated they will want these planes

During his testimony, Dermody reiterated his union's intention to start a third-round of wage increases. He also said that UE intended to eliminate geographical differences in wage and salary levels. He emphasized that the sub-standards of rural plants should not be held as a criterion for setting the national level.

Machinery Firm Named in Suit

WASHINGTON—A civil anti-trust suit charging the United Shoe Machinery Corp., Boston, Mass., with violating the Sherman Anti-Trust Act by monopolizing the shoe machinery industry has been filed by the Justice Department in Boston.

The action seeks to compel the United States Shoe Machinery Corp. to sell all of its plants used in the manufacture of shoe factory supplies and some of its plants engaged in the manufacture of shoe machinery and tanning equipment. The suit also asks that the company be made to offer to sell its machinery to shoe manufacturers instead of leasing, and to make available to its competitors all patents and know-how relating to shoe machinery.

The complaint states that the defendant manufactures more than 90% of most of the important types of shoe machinery, and is the only company in this country which can completely equip a shoe factory with all necessary machinery.

Atty.-Gen. Clark said in the complaint that "by reason of the defendant's monopoly it is impossible for an American shoe manufacturer to own most of his machinery. This is contrary to our tradition and principles of free private enterprise. We are seeking to end this monopoly which has destroyed the independence of the shoe industry."

Concern Seeks Plant for Jets

BRIDGEPORT, CONN.—Plans are being formulated to transfer the Chance Vought Division, United Aircraft Corp., in part to Dallas, Texas. A proposal has been submitted to the U.S. Navy Department for the purchase of the government-owned North American Aviation Co. plant, Dallas. The Navy took over the plant Dec. 1.

The Navy is interested in Chance Vought as a source for the production of jet planes in Dallas. Production of the Chance Vought F4-U-5 with piston engine will be continued at Stratford, Conn. These are first-line fighter planes and Chance Vought has a recent order for 328.

If acquired, the plant at Dallas will require up to two years to retool for production of jet planes. Chance Vought is developing the XF6-U-1 jet fighter plane for the Navy.

Pratt & Whitney Aircraft Division is getting set up to make Rolls-Royce Nene jet engines. The concern is also developing its own jet engine. It will be a year before the Nene will be rolling off the production line.

The Dallas plant has 3 million square feet of floor space. The buildings are air conditioned and designed for aircraft manufacturing. Outside space is available for testing.

Machinists' Union Wins

WASHINGTON—The International Association of Machinists became the first Union to take bargaining rights away from another union which has not complied with the Taft-Hartley filing requirements when it won an election at Sigmund Cohn Mfg. Co., N. Y.

CIO Retail, Wholesale and Department store employees, kept off the ballot, lost its contract.

Management and Unions Cooperate In St. Louis Metalworking Firms

ST. LOUIS—Management-labor relations and productivity in metalworking plants are both at excellent levels here following the flurry of strikes some months ago.

Discussions with executives in half a dozen major companies indicate that a major reason for the acceptance of unions by management is the conviction of local union officials that management has accepted them. Managements are firm, but free and fair. Unions are cooperative even to the extent of accepting incentive systems. In all these cases, management has granted maintenance of membership, but shops are open. Both independent and C.I.O. unions are involved.

Number of Methods Used

A number of methods are used to convey management ideas to labor. One company has a labor-management committee, including union officials, but no company administrative officers. One representative is elected from each department and three production executives have been assigned to the committee by the company. The committee has real power and supervises the plant paper, the suggestion system, bulletin boards and posters, donation fund, safety methods and blood bank. In other companies, information is conveyed to labor through the union, through monthly magazines, foremen and bulletin boards. No direct method is used which could be interpreted as circumvention of the union.

Company Seeks Grievances!

In most cases, dealings with the union are in the hands of the company president or vice president. Grievances are handled promptly, one company even making certain that some grievances always exist. As a result of this policy, one recent grievance had to do with the need for an incentive system in a department which did not have one. Skilled labor is at a premium, but unskilled labor is in sufficient supply, although turnover is common. One company reports that in the process of increasing its working force of 1,000 to 1,036, it was necessary to hire 540 people.

Increases in capacity are common in St. Louis. One company for example, has doubled its capacity in the last year and a half buying war surplus equipment at 48¢ on the dollar. This company will buy any new equipment that will pay off in three years. These plants are handling a volume of sales (before price correction) which frequently runs three to four times pre-war volume.

Present shortages apear to be in electric and deep-drawing sheet steel and in copper shapes. In some cases, aluminum is being substituted, but no adequate substitute has been found for copper in electrical equipment.

Railroads Disappointed

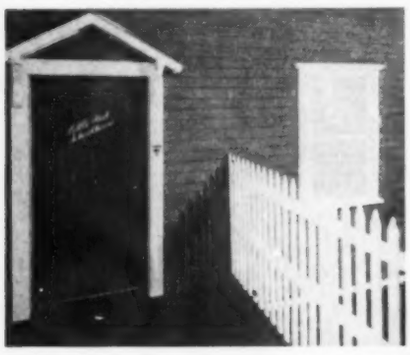
CHICAGO—Bitter disappointment over the allotment of steel to railroad shops for car-building has been expressed by Chicago railroad men.

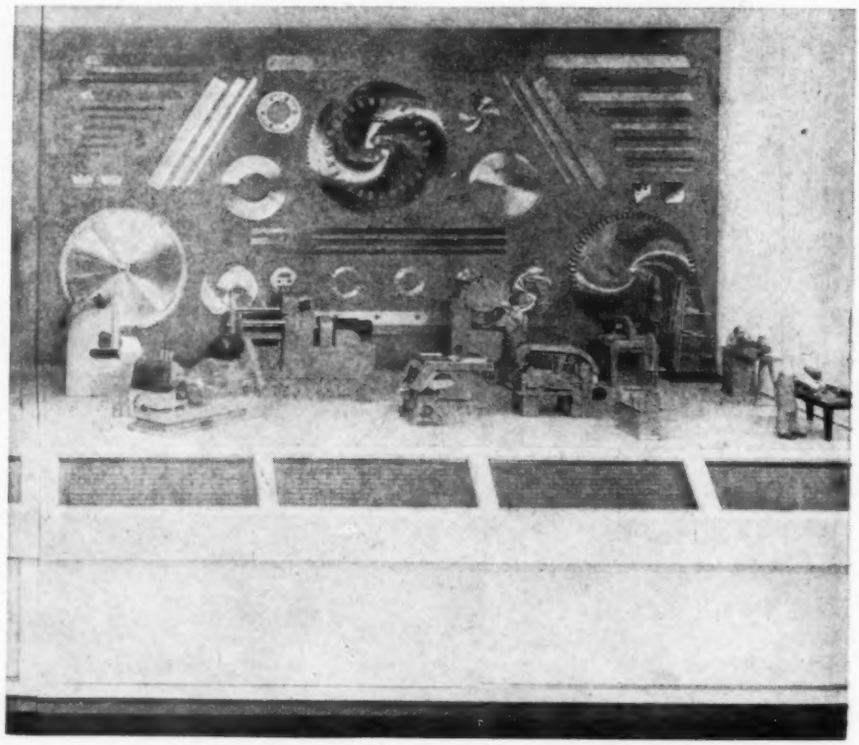
They believe they should get a larger percentage of steel for freight cars because their shops have been expanded. They point out with pride that under the former 10,000-car-a-month goal for the industry the railroad shops were assigned a quota of 2,000 cars a month, but they made as many as 3,800. On the other hand car-builders failed to meet their quotas.

Court Backs NLRB

WASHINGTON—Reinstatement by NLRB of a foreman discharged three years ago by Edward G. Budd Mfg. Co., Detroit, was upheld by the U.S. Supreme Court. However, NLRB's order to cease interfering with foreman union activities was referred back to the circuit court for reconsideration in the light of the Taft-Hartley Law, which denies foremen bargaining for protection.

This will become a constitutional test of the foreman clause in the Taft-Hartley Labor Law.





Metalworking in Miniature—To speed familiarization of distributor salesmen with typical machines using its saws and associated products, Simonds Saw & Steel Co. has installed a "Little Red Schoolhouse" (left) in its plant suspended at the gallery level. The school overlooks the 5-acre windowless plant. Inside are models, grouped industry by industry in a natural setting. Final one of six is this metalworking model, including circular cold saw, squaring shear, two metal-cutting bandsaws, table and circular saw (plastics and light alloys) lathe and a bench hand backsaw. The room also contains a panel section for a movie screen and displays. Chairs, projector and associated "props" are stored in a special end room next to wash rooms and coat racks off the entrance hall

Business Booms in Chicago Area; Employment Up

CHICAGO — Output continues to boom along in the Chicago area metalworking plants. The 1947 total output of manufactured goods is estimated at $11.5 billion, which is equal to the peak wartime rate in dollars, although not in physical volume. But the 1947 rate is up 25% over 1946 and aggregates 300% of the 1939 production value.

Production of metals and machinery accounted for some $5.5 billion of the 1947 output total in the Chicago area, and metal producing and working facilities turned out roughly 40% more in dollar value than they did in 1946. Also indicative of the better progress, relatively speaking, of the metalworking factories is the fact that electrical machinery and some other specific metalworking branches hit a rate 400% above 1939.

Metalworking executives, meanwhile, report that business remains as good or better than it was earlier in the year. Because employment is at record high levels — one out of every two persons living in the Chicago area is now gainfully employed, the same astonishing total that prevailed at the peak of the war effort—and because production is high, order backlogs of some firms are decreasing. But the flood of new orders that continue to pour in, especially in railroad equipment and farm machinery, are tending to boost the backlogs of some firms.

Many purchasing agents report that deliveries are getting to a point that might be considered normal. While no improvement in the steel situation was noted, deliveries of component parts and supplies are satisfactory. But the increasing levels of prices and the fears of allocations or federal controls to aid European recovery make some metalworking executives suspect that another inventory boom may be in the making.

High-Pressure Test Unit Will Be Built for Navy

BARBERTON, OHIO—A high-pressure test vessel, designed specifically for sonar measurements, will be built by the Babcock & Wilcox Co. for the Navy's Underwater Sound Reference Laboratory, Orlando, Fla.

The vessel, which has an inside diameter of 100 inches and an overall straight length of 25 feet 8 inches, will have a 1,000-pound working pressure. It will be fabricated of 4-inch steel. The unit will be used to test operation of instruments and fittings.

Harold B. Smith, president, Illinois Tool Works, was one of three directors elected by the National Machine Tool Builders' Association at the 46th annual meeting at Hot Springs, Va., recently

NTDMA President Names Chairman

CLEVELAND — William R. White, Jr., Midwestern Tool Co., Chicago, president of the National Tool & Die Manufacturers Association, has announced the following chairmen of standing committees:

Apprenticeship, Willis G. Ehrhardt, Ehrhardt Tool & Machine Co., St. Louis; awards, Alfred Reinke, Gus Reinke Machinery & Tool Co., Hillside, N. J.; business conduct, Joseph N. Huser, B & H Specialty Co., Indianapolis; business management, Richard F. Moore, Moore Special Tool Co., Bridgeport, Conn.; by-laws, John H. Benetz, Bridge Tool & Die Works, Philadelphia; fact-finding, J. J. Kohl, International Tool Co., Dayton; finance, Jerome H. Stanek, Stanek Tool & Mfg. Co., Milwaukee.

Also, government relations, R. E. Ehrhardt, Norwood Engineering Co., Dayton; industrial relations, Herbert C. Murrer, Murrer Tool Co., Inc., Cincinnati; membership, R. H. Cope, Bunell Machine & Tool Co., Inc., Cincinnati; planning, Benjamin C. Buerk, Buerk Tool Works, Buffalo; public relations, Herbert Harig, Harig Mfg. Corp., Chicago, and technical, Charles W. Neumann, Argus Engineering Co., Hartford, Conn.

Materials Handling Session

CLEVELAND — More than a score of experts will speak at the Conference on Materials Handling to be held in the Public Auditorium concurrently with the National Materials Handling Exposition Jan. 12-16.

Union Leaders Set Goals For Political Funds

WASHINGTON — Political activity will keep union leaders as well as politicians on the move next year. All of the big labor organizations are raising huge political funds and building organizations to try to elect members to Congress who will vote for repeal of the Taft-Hartley Law and other legislation favored by labor leaders.

Here they are in a nutshell:

CIO Political Action Committee—collecting $1 contributions from 6 million members, or possibly $6 million.

AFL Labor's Education and Political League — Seeks to rise $7½ million by $1 contributions from AFL members.

Railway Labor's Political League —18 railroad brotherhoods will seek donations from 1¼ million members. Trainmen and engineers are not included as they have their own programs.

Machinists' Non-Partisan Political League—The International Association of Machinists hopes to raise $1-million fund from 630,000 members and outsiders.

Communication Workers of America — Legislative committee of this independent telephone union is asking $1 contributions from 233,000 members.

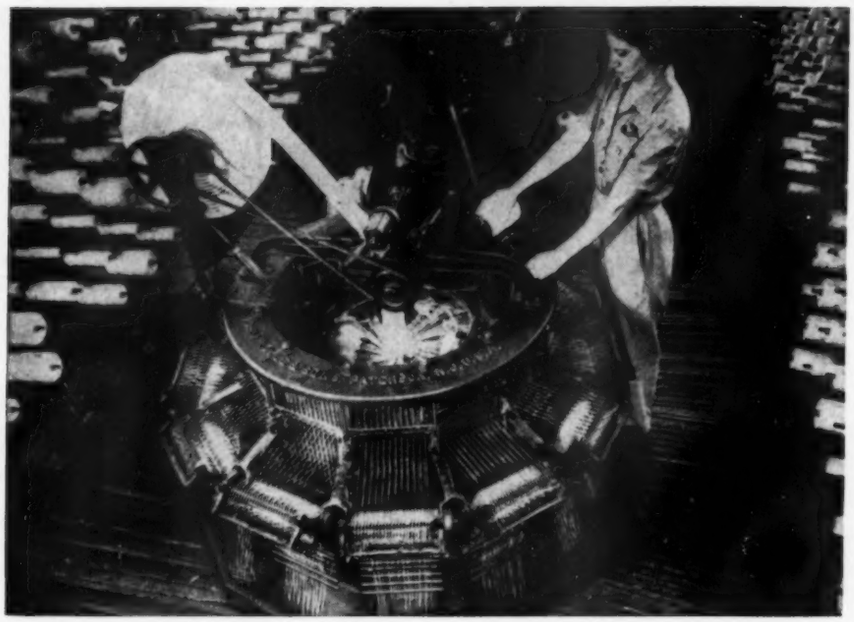
Labor's Non-Partisan League — John L. Lewis's political organization, has not announced plans for political action in 1948.

Founders' Society Plans Campaign

CLEVELAND—An advertising campaign will be instituted by the Gray Iron Founders' Society during the first quarter of 1948, R. L. Collier, executive vice president, announced recently for the purpose of aiding industrial buyers to obtain desired castings for specific purposes.

The campaign will also be aimed at enlarging the field the industry believes it can best serve and at the same time recapture any segment of the industry which has turned to other materials.

According to Mr. Collier's plans all members of the society, whose members represent 80% of the production of the 2500 gray iron founders in the country, will participate by providing case histories of the advantages of using such castings as well as the photographs used for illustrative purposes in the advertising campaign to further the interests of the gray iron foundry industry.



Intricate Mechanism weaves fire hose at the Buffalo plant of the Hewitt Rubber Division, Hewitt-Robbins, Inc. If laid in a straight line, there is enough cord in a 50-foot section of the hose to extend a distance of 10 miles

Joint Mission to Study Shipping Iron, Steel Scrap from Germany

WASHINGTON—About a year ago, when the demand for iron and steel scrap created a lot of talk, government officials submitted the idea of bringing back some of the European battlefield and rubble scrap for American steel furnaces.

That idea fell flat when the Army said there was no one to collect and prepare the stuff for shipment, transportation both inside and outside Germany was inadequate, and finally, because the price delivered on U. S. docks would be too high.

Now the idea has sprung up again —and this time it just might work. A joint government - industry mission is going to Europe to appraise the supply of Army-owned scrap in Germany and to report on the extent to which it is economically feasible and desirable to ship it back to the United States.

Three Reasons in Favor

There are three reasons why the idea might work now when it would not have a year ago.

1. A year ago the domestic OPA and post-OPA price hovered around $20 to $30 a ton. Collection shipment, handling and other costs combined to make dockside price of the foreign metal too high. Now, however, the domestic price is around $40 or higher and the increase over last year is about enough to make it feasible to ship across the Atlantic.

2. In addition, ocean shipping, tight last year, is now running back from Europe empty, for the most part. Because of this one-way load factor, scrappers think they will be able to get a concession on freight rates, further reducing costs.

3. Where there was no organized scrap collecting agency in Germany last year, there is now. The Canterbury Corp., an American - owned scrapping operator, has in recent months been collecting German scrap, shipping it to Italy for processing, and exporting to the U. S. The Fiat Motor Co. in Italy has been preparing the scrap for export, on a contract with Canterbury. Now, however, Canterbury plans to dissolve its deal with Fiat, and ship through Bremerhaven direct. Shipments now are running about 600 tons a day. They are expected to increase to 1,000 a day when the operation moves to Bremerhaven.

Kaiser-Frazer To Spend $250,000 In Foundry Unit

DOWAGIAC, MICH. — The Kaiser-Frazer Corp. Foundry Division will spend $250,000 for new equipment and a remodeling program, Sydney W. Taylor, general manager, has announced.

Changes in the plant and new equipment are aimed at better facilities for controlling quality, improved material handling and working conditions. The foundry is now producing eight major castings for the Kaiser and Frazer automobiles.

Military Fights Commerce Dept. On Stockpiling

WASHINGTON — A full-scale Marshall Plan, if enacted, will call for enormous quantities of all natural resources. Steel, aluminum, tin, lead, cadmium, alloying metals, and other metallics and coal will be short in varying degrees. Steel will be the worst.

While the country is producing full tilt to supply Europe, the military stockpilers will be faced with the difficult situation of either sitting back and deferring stockpiling of these materials, or interfering with civilian procurement.

A behind-the-scenes battle between the military and Commerce Department now in progress over whether or not to stockpile and infringe on civilian supply will have to be settled by the President.

Inclusion in the Marshall Plan legislation of a "repayment by stockpiling" clause, through which foreign nations would ship strategic and critical materials, surplus in their own economy, to the military stockpile, could prevent military-civilian market competition here. The only trouble is—there probably won't be enough of the items available for any material contribution to the pile for a long time.

A bitter fight in Congress over the "repayment-by-stockpiling" measure is indicated. The possible result —a return to wartime minerals production subsidies.

Planning Group To Study Plants

WASHINGTON—Sharon Steel Co., Sharon, Pa., and Lockheed Aircraft Corp., Burbank, Cal., are among 15 plants which the National Planning Association will include in a study of "Causes of Industrial Peace Under Collective Bargaining."

Investigation already has begun in eight of the 15 plants to analyze the reasons for peaceful bargaining relationships. Reports will be released as they are completed and later will be published in a book.

Sharon Steel has had remarkably good relations with the United Steel Workers of America, CIO, dating back to the time of the Little Steel strikes. While other steel companies resisted the union, Sharon Steel consented to a National Labor Relations Board election and agreed to recognize the union if it won.

Since then, the company has had no strikes and all grievances have been settled before reaching arbitration.

Names in the News

Samuel Koffsky

Robert L. Devitt

Samuel Koffsky, chief engineer of the Simmons Machine Tool Corp., Albany, N. Y., has been named general manager of the Simmons Fastener Corp. Mr. Koffsky, who has been associated with Simmons for 15 years, will remain in charge of engineering for the parent company. **Robert L. Devitt,** formerly production manager of the machine tool firm, has been named manager of the New York office succeeding **William Werley,** who will handle sales in southern territories.

Philip A. Snyder has been named general sales manager and **Charles E. Horne,** general superintendent, of the new Salem, Va., plant of the Specialties Div., The Yale & Towne Manufacturing Co.

Robert T. Keller has been appointed vice president of the Marine and Industrial Engine Divisions of Chrysler Corp. He assumes the duties of general manager, with headquarters at the Chrysler Jefferson plant.

Harold E. Bruns, former secretary and treasurer of The Lauson Co., New Holstein, Wis., has been elected president and general manager of the firm succeeding **E. A. Longnecker,** resigned.

George J. Zimmerman, president of Strong, Carlisle & Hammond Co., Cleveland, since 1940, and manager of its machinery division for more than a decade, retired Dec. 31. **Edward L. Mack,** former assistant manager, succeeds Mr. Zimmerman as manager of the machinery division. **Kenneth C. Plasterer** has been named head of a newly created quality control department of the Lincoln-Mercury Div. of Ford Motor Co.

Samuel Insull, Jr., has been elected a vice president of Stewart-Warner Corp. He will continue to be in charge of the firm's radio division.

Sherman H. Perry, who has been associated with Chase Brass & Copper Co., Waterbury, Conn., since 1924, as general sales manager, has been named vice president in charge of sales. He is succeeded in his former post by **Marvin A. Joy.** New manager of the Chase Warehouse Div. is **William A. Amelung,** while **Harry E. Gordon** is assistant sales manager.

C. M. Snyder has been named manager of the New England sales district office of the Lamp Department, General Electric Co. He succeeds **C. C. Walker,** who becomes commercial vice president in Boston.

J. L. Miller, production superintendent of the Johns-Mansville factory since 1942 at Zelienople, Pa., has been appointed plant manager.

L. D. Morton has been named eastern district manager of Kennametal, Inc. in the firm's new New York office.

Louis J. Baudis has been named chief engineer of the Bullard Co., Bridgeport, Conn. He has been associated with the firm since 1935 and has served as development engineer and assistant to the vice president in charge of manufacturing. **Robert W. Waring,** formerly with the Bridgeport Brass Co., has been appointed assistant chief engineer.

Mark R. Dull, Jr. has been appointed assistant general manager of Willys Overland Export Corp. For the past two years Mr. Dull has been managing director of Willys-Overland de Mexico.

N. George Belury has been appointed appointed vice president of the Engineered Castings Div., the American Brake Shoe Co., while **Harry C. Platt** has been named works manager with headquarters in Rochester, N. Y.

Ephraim M. Detwiler, assistant works manager of the Buffalo works of Worthington Pump & Machinery Corp., has been promoted to the position of works manager of the Worthington works in Holyoke, Mass.

C. H. Hopper has been named general factory superintendent of Oneida Products Corp., Canastota, N. Y., manufacturer of bus bodies. Mr. Hopper recently resigned as production manager of ACF-Brill Motors to join Oneida.

David A. Mowrer, chief service engineer, has been named head of all engineering service activities for Boeing Aircraft Co., Seattle, Wash.

M. H. Blesh has been appointed manager of manufacturing in the Control Division of General Electric Company's Apparatus Department. Also, **C. B. Bradish** has been named manager of engineering and **E. A. Green,** manager of sales.

Augustus Vogel, Jr., has been appointed area manager of the Nicholson File Co., Providence, R. I., in Michigan, Indiana, Ohio, Kentucky, and western Pennsylvania.

H. O. Holland has resigned as vice president of the Kellogg Div., American Brake Shoe Co., Rochester, N. Y. **Selby F. Greer,** general sales manager of the division, is taking over Mr. Holland's former duties.

Walter M. Boyden has been appointed sales manager of the Hy-Pro Tool Co., New Bedford, Mass.

Edward L. Hallin, Jr. has been appointed machinery sales representative of Joseph T. Ryerson & Son, Inc., to cover the Buffalo, Pittsburgh and Cleveland areas with headquarters at the Ryerson steel service plant in Carnegie, Pa.

Robert M. Gaunt is representing E. C. Atkins & Co., Indianapolis, Ind., in southern Texas, and Louisiana, with headquarters in Houston.

Leonard C. Heinlein has been appointed to the newly-created position of assistant superintendent for the Link-Belt Company's Ball & Roller Bearing Division plant in Indianapolis.

W. B. Whenthoff has returned to Houston, Texas, in charge of marketing the products of Tube Turns, Inc., Louisville, Ky., in that area. He joined Tube Turns in 1937 when he opened the firm's Tulsa office. In 1941 he established the Houston office.

Edward G. Lickteig

opened the firm's Tulsa office. In 1941 he established the Houston office.

Edward G. Lickteig has been appointed master mechanic of the Kaiser-Frazer Detroit Engine Div. Mr. Lickteig succeeds **N. J. Blake** who has returned to Willow Run on special assignment. Before joining Kaiser-Frazer, Mr. Lickteig was master mechanic in the tooling of the Chrysler Airtemp plant, Dayton, Ohio.

E. A. Longnecker has been named president and general manager of The LeRoi Co., Milwaukee, Wis. He was formerly president and general manager of The Lauson Co., New Holstein, Wis.

DeRoss Salisbury, Jr., has been appointed abrasive field engineer for the Norton Co., Worcester, Mass., in the Cleveland area.

BUSINESS ITEMS

Buckeye Forgings Co., Cleveland, has been purchased by the **Miller Manufacturing Co.,** Detroit, and will be operated as a wholly-owned subsidiary. **Harry Bower,** former Buckeye vice president, is in charge of the subsidiary.

The Lake Erie Engineering Corp., Buffalo, N. Y., has appointed **Reider Thoreson** and **Fred McCosh** to handle its complete line of metalworking and plastic molding presses in Michigan and Ohio. Their offices are located at 1115 Book Bldg., Detroit.

The Sundstrand Machine Tool Co., Rockford, Ill., has made two additions to its sales organizations of the Industrial Hydraulic Div. **P. A. Anderson,** Box 166, Lakeville, Conn., has been named eastern sales representative, while the **Burgan Machinery Co.,** 9527 Fifth Ave., Inglewood, Calif., has been named western sales representative.

The Detroit Broach Co. has appointed three new sales representatives: **The G. C. Wood Co.,** 613 Clark Bldg., 717 Liberty Ave., Pittsburgh, in southeastern Pennsylvania; **William K. Nelson** of 235 Plymouth Bldg., Minneapolis, covering northern Wisconsin, Minnesota, North and South Dakota, and Montana; and **C. H. Rodgers & Co.** for southern Ohio and Kentucky with offices at 705-6 Gerke Bldg., 123 E. Sixth St., Cincinnati.

Bison Machinery & Tool Supply Co., Inc., has been incorporated in Buffalo by **Thomas Scanlon, Thomas F. Meyers** and **Frank X. Keil.**

American Brake Shoe Co. recently opened its two new nonferrous foundries at Niles, Ohio, and Meadville, Pa. The Meadville plant replaces an older plant and will manufacture bronze bearings and castings, while the Niles foundry will manufacture railroad journal bearings.

American Cam Co., West Hartford, Conn., which began operations in 1945, has been incorporated.

Market Forge Co., Everett, Mass., has appointed **Claude C. Mason & Co.,** Atlanta, Ga., as its regional sales representative in the southeastern states.

The Wel-Met Co., Kent, Ohio, has appointed **Richard H. Khuen,** 820 South Maple Ave., Oak Park, Ill., as its regional sales representative in Illinois, Iowa, Wisconsin and Missouri.

The Lovejoy Tool Co., Inc., Springfield, Vt., has named the **Burleigh-Stocker Machinery Co.,** 23675 Woodward Ave., Pleasant Ridge, Mich., as exclusive representative in eastern Michigan.

Gar Wood Industries, Inc., Wayne, Mich., has established four regional sales offices. Managers include **Ross Miller** in San Francisco for the western region; **W. G. Barrett** located in Boston covering the northeast; **A. C. Berg** in Wayne, Mich., heading the central region; and **H. C. Hatch** in Washington, D. C., as supervisor of the southeastern region.

Tri-Cities Metal Products, Inc., has been incorporated in Endicott, N. Y., by **William Remelius, Ernest E. Marble** and **Minnie Marble.**

E. W. Bliss Co., Detroit, has transferred its Cleveland sales office from the N.B.C. building to the Bliss plant on E. 222nd St., Euclid.

OBITUARIES

Robert B. Skinner, 55, passed away Dec. 4. A former official of the Skinner Chuck Co., New Britain, Conn., Mr. Skinner left the firm in 1935 to become vice president and general manager of the D. E. Whiton Machine Co. At the time of his death he was a sales representative for the Udylite Corp., Dayton, Ohio.

D. J. Sullivan, Sr., chief tool engineer of the National Twist Drill & Tool Co., Rochester, Mich., died Nov. 16.

James D. Boucher, president of the Caldwell Manufacturing Co., Rochester, N. Y., died recently. He formerly was a vice president of the Kellogg Co., Rochester.

Leo C. Conradi, 57, technical director of research and development for Standard Steel Spring Co., Coraopolis, Pa., died Dec. 4. Before joining Standard in 1942 he was associated with International Business Machines Corp., Endicott, N. Y., for many years.

Dennis A. Crowley, 53, chief metallurgist at the Duquesne Works of Carnegie-Illinois Steel Corp., Pittsburgh, since 1925, died Nov. 16.

A. E. Harrison, 81, retired general superintendent of foundries of the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., died Dec. 2. Mr. Harrison joined the former E. P. Allis Co. in 1881 as a pattern maker apprentice and retired in 1934.

George R. Huntley, who retired in 1946 as assistant manager of products control of the Carborundum Co., Niagara Falls, N. Y., died recently.

John Wennerlund, retired chief engineer of the Götaverken shipyard, Gothenburg, Sweden, died recently. Mr. Wennerlund was well known to machinery builders in this country.

MEETINGS

Materials Handling Exposition. Public Auditorium, Cleveland, Jan. 12-16. Clapp & Poliak, 350 Fifth Ave., New York.

Pressed Metal Institute. Annual meeting. Hotel Statler, Buffalo. Feb. 10-11. Sam Morrison, vice president, Morrison Steel Products, Inc., Buffalo, chairman.

Society of Automotive Engineers. Annual meeting. Book-Cadillac Hotel, Detroit. Jan. 12-16. John A. C. Warner, secretary and general manager 29 West 39 St., New York.

in one *Quick* operation

12 measurements *8* classifications

automatically stamped

Operator merely loads and unloads the parts. Accuracy of check is entirely independent of the human element. Automatic color stamping during the gaging cycle indicates classifications into which parts are to be segregated. Hourly rate of operation is between 500 and 700 pistons, depending upon efficiency of the operator.

While this "miracle" of inspection productivity has been accomplished by Sheffield on automotive pistons, thousands of other parts can be multiple-inspected with proportionate savings and increases in productivity.

Yours can be one of the many plants to reap the benefits of multiple and automatic inspection equipment developed and built by Sheffield. If it's "inspection productivity" you want, *Chek with Sheffield,* first the pioneer and now the leader in the manufacture of multiple and automatic inspection equipment.

Wire, phone or write for a Sheffield Field Engineer to call and discuss your problem —or send prints and an outline of your requirements to Sheffield at Dayton.

Sheffield's
principal products include
GAGES
MEASURING INSTRUMENTS
MACHINE TOOLS
TAPS and
CONTRACT SERVICES

•

Standard Gages shipped within 24 hours

the *Sheffield* corporation

Dayton 1, Ohio Sheffield MASTER CRAFTSMEN ***U.S.A.***

2588

WEAR and MISALIGNMENT are constant enemies of Precision Measurement

MICROMETER and SINE PLATE BOTH REQUIRE PERIODIC INSPECTION TO CERTIFY THEIR ACCURACY

When a micrometer is suspected of inaccuracy, its calibration is certified with the aid of gage blocks. Until recently sine plates were without benefit of a similar method of inspection. The wear or misalignment of the pins were difficult to detect.

Webber Angle Blocks have changed all of that as they provide a quick check with an accuracy measured in millionth parts of a circle. Now a sine plate can get the same on-the-spot appraisal as is accorded a micrometer.

Webber Angle Blocks are more than master angles. They are shop tools for setting and inspecting angles with or without the aid of sine bar.

Furthermore, almost anyone can use them. The angle is read directly off the blocks by the simple addition and subtraction indicated on block surfaces.

A new application chart is now in preparation.

Reserve copy by writing.

WEBBER GAGE COMPANY, 12901 Triskett Rd., Cleveland, 11 Ohio

WEBBER MAKES PRECISION GAGE BLOCKS EXCLUSIVELY

- ★ Gage Block Sets in Steps of .00005".
- ★ Individual Special Size Blocks.
- ★ Heavy Duty Gage Blocks.
- ★ Angle Gage Blocks in Steps of one second.
- ★ Carblox (Carbide) Wear Gages.

Webber
PRECISION
GAGE BLOCKS

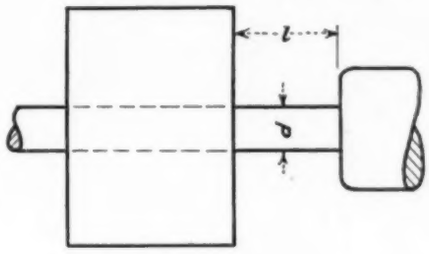
American Machinist

REFERENCE BOOK SHEET

Rules for Upsetting Bar Stock

COURTESY AJAX MANUFACTURING COMPANY

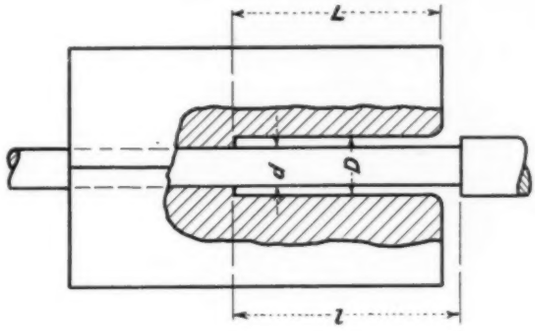
UNSUPPORTED WORKING STOCK—ONE BLOW



RULE I—Exposed working stock up to a maximum length of three diameters can be upset without support to prevent bending.

Working Recommendation: $l \leq 2\frac{1}{2}\ d$

STOCK SUPPORTED IN DIE IMPRESSION—ONE BLOW

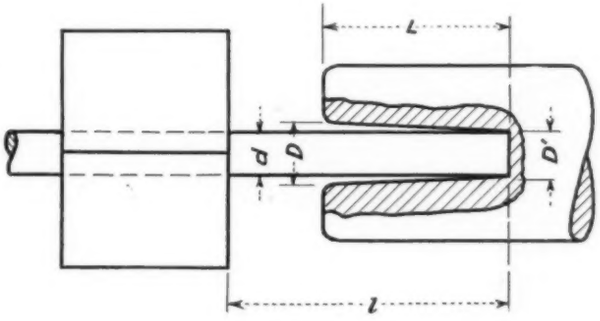


RULE II—Working stock longer than three diameters will be supported against injurious bending by a die impression of a diameter not greater than 1½ times the diameter of working stock, if the length of stock projecting beyond the impression is less than half the diameter.

Working Recommendation: $D \leq 1.4\ d$

$L > l - \frac{1}{2}\ d$

STOCK SUPPORTED IN TOOL RECESS—ONE BLOW



RULE III—Working stock longer than three diameters will be supported against injurious bending by a heading-tool recess of a diameter not greater than 1½ times the diameter of working stock at the mouth and 1⅛ times the diameter of working stock at the bottom and a length at least two-thirds the length of working stock.

Working Recommendation:

$D \leq 1.4\ d$ $\qquad L \geq \frac{2}{3}\ l$

$D' = 1.1\ d$ $\qquad L = l - 2\frac{1}{2}\ d$

Note: *Repeated applications of the second and third rules* make possible the upsetting of great lengths of original bar stock. Preference is given to recessed heading tools for stock gathering, because of their durability and because the upsets are free from flash, which tends to form at the die part-line and around the periphery of plunger-like heading tools when upsetting in grooves in the die.

MISTER
IF YOU'RE HARD TO CONVINCE
YOU'RE OUR MAN!

We can prove to you that

SPEED TREAT STEEL

MEDIUM HIGH CARBON FOR HEAT TREATING

Will increase your production 30 to 50% . . . Reduce your hardening cost, with flame or induction hardening 56 to 62 Rc. water quench—54 to 58 Rc. oil quench . . . Reduce warpage *and* breakage . . . Improve your product and its finish, while lengthening tool life 3 to 4 times . . . Reduce multiple stocks by replacing C1043 – C1045 – C1137 – C1141 and C1144.

LET US PROVE IT AT OUR EXPENSE

Write us for samples of Speed Treat and Speed Case Steel. Our Production Expert will follow them to your plant and make his demonstration. Investigate SPEED CASE . . . you can't lose!

SPEED CASE STEEL
LOW CARBON
OPEN HEARTH
FOR CARBURIZING

If you have a tough one to whip . . . TRY SPEED TREAT STEEL!

Tear off here ATTACH TO YOUR LETTERHEAD AND MAIL TO EITHER COMPANY BELOW

The *Licensee for Eastern States*
FITZSIMONS STEEL COMPANY
YOUNGSTOWN, OHIO

MANUFACTURERS OF A COMPLETE LINE OF COLD FINISHED CARBON AND ALLOY STEEL BARS

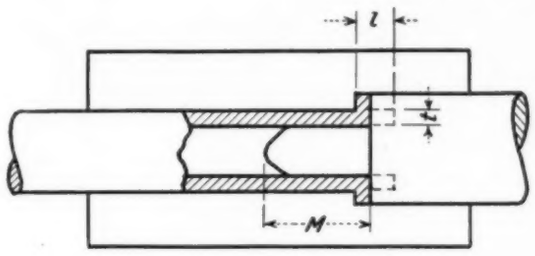
Licensor
MONARCH STEEL COMPANY
HAMMOND · INDIANAPOLIS · CHICAGO
PECKOVER'S LTD Toronto, Canadian Distributor

ACTUAL PHOTOGRAPH
Speed Case Steel (.20 carbon) 1 inch cold drawn bar tied in a knot, cold, without fracture.

Rules for Upsetting Tubing

COURTESY AJAX MANUFACTURING COMPANY

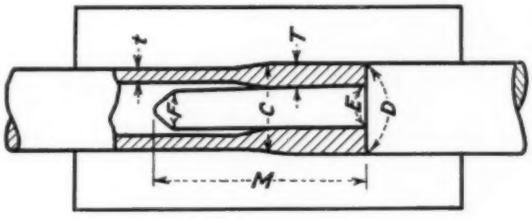
FLANGING—ONE OPERATION



RULE I—Working stock up to a maximum length of 2½ times the wall thickness can be upset in one operation without support to prevent buckling.

Working Recommendation: $l \leq 2\frac{1}{2}\,t$

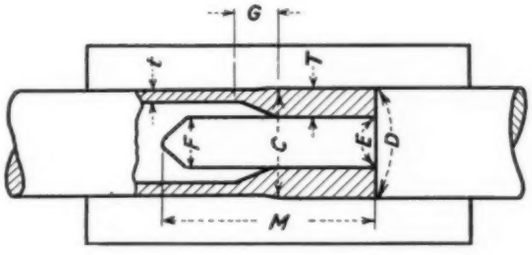
OUTSIDE UPSETTING—ONE OPERATION



RULE II—Wall thickness of working stock can be increased to a maximum of 1½ times its original thickness in one operation by upsetting to the outside; that is, increasing the outside diameter of the tubing at the upset. When greater wall thickness is required, successive outside upsets can be made, using the minimum wall thickness of the preceding upset as t in Rule II,

Working Recommendation: $T \leq 1.4\,t$

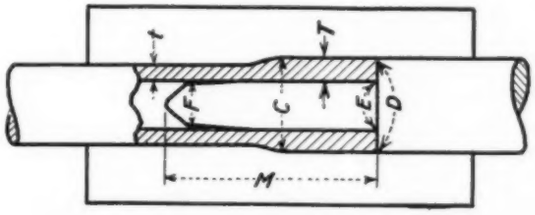
INSIDE UPSETTING—ONE OPERATION



RULE III—Wall thickness of working stock can be increased to twice its original thickness in one operation by confining the outside diameter and upsetting to the inside; that is, decreasing the inside diameter of the tubing. When greater wall thickness is required, successive upsets can be made using the minimum wall thickness of the preceding upset as t in Rule III.

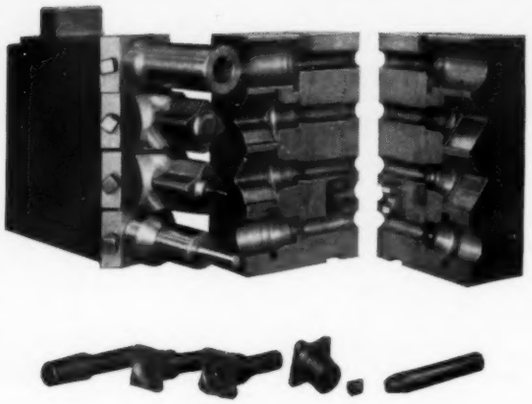
Working Recommendation: $T \leq 2\,t$

OUTSIDE AND INSIDE UPSETTING



RULE IV—Wall thickness of working stock can be increased up to a maximum of 1½ times its original thickness in one operation by upsetting to the outside and inside simultaneously; that is, increasing the outside diameter and decreasing the inside diameter in the same operation.

Working Recommendation: $T \leq 1.4\,t$



Forging Machine dies and tools and progressive forging operations for producing pierced drive shaft flange. The punch slug sheared from the end of the bar after forging is the only waste.

AJAX FORGING MACHINES Maintain Leadership in Advanced Design and More Efficient, High Production Forging

From the 2" to the 8" every Ajax Forging Machine is built embodying the sound mechanical features of a One Piece Solid Steel Bed Frame, Continuous Crankshaft Housings, a highly efficient, patented, Direct-acting Air Clutch, an under arm Extension Guided Header Slide, a top Suspended Outboard Guided Die Slide, Cam Actuated Die Grip with Self-contained Automatic Safety and an Automatic Lubricating System.

Such sound mechanical features as these, built to a highly advanced and thoroughly proven design, result in machines that are more efficient in this method of hot forming metal than any previously offered to industry.

Combined with the splendid mechanical performance of these machines, the Ajax Engineering Department stands ready to render service to users by supplying layouts of progressive forging operations to produce out-of-the-ordinary forgings on an efficient high production basis.

WRITE FOR BULLETIN NO. 65-C

THE AJAX MANUFACTURING COMPANY

EUCLID BRANCH P. O. CLEVELAND 17, OHIO

110 S. DEARBORN ST. CHICAGO 3, ILLINOIS

DEWART BUILDING NEW LONDON, CONN.

Wiring for Electric Motor Circuits

COURTESY WESTINGHOUSE ELECTRIC CORPORATION

FULL-LOAD CURRENTS

Direct-Current Motors*
(Amperes at Full Load)

Hp.	115v.	230v.	550v.
½	4.6	2.3	
¾	6.6	3.3	1.4
1	8.6	4.3	1.8
1½	12.6	6.3	2.6
2	16.4	8.2	3.4
3	24	12	5.0
5	40	20	8.3
7½	58	29	12.0
10	76	38	16.0
15	112	56	23.0
20	148	74	31
25	184	92	38
30	220	110	46
40	292	146	61
50	360	180	75
60	430	215	90
75	536	268	111
100		355	148
125		443	148
150		534	220
200		712	295

Single-Phase A.C. Motors
(Amperes at Full Load)*

Hp.	115v.	230v.	440v.
⅛	3.2	1.6	
¼	4.6	2.3	
½	7.4	3.7	
¾	10.2	5.1	
1	13.	6.5	
1½	18.4	9.2	
2	24.	12.	
3	34.	17.	
5	56.	28.	
7½	80.	40.	21.
10	100.	50.	26.

Two-Phase A.C. Motors (4-wire)

Induction, Squirrel-Cage and Wound Rotor Amperes				Synchronous Type †Unity Power Factor Amperes				
110v.	220v.	440v.	550v.	2300v.	220v.	440v.	550v.	2300v.
4	2	1	.8					
4.8	2.4	1.2	1.0					
6.4	3.2	1.6	1.3					
8.8	4.4	2.2	1.8					
11.2	5.6	2.8	2.2					
	8	4	3.2					
	13	7	6					
	19	9	8					
	24	12	10					
	34	17	14					
	45	23	18					
	55	28	22	6	47	24	19	4.7
	67	34	27	7.5	56	29	23	5.7
	88	44	35	9	75	37	31	7
	108	54	43	11	94	47	38	9
	129	65	52	13	111	56	44	11
	158	79	63	16	140	70	57	13
	212	106	85	21	182	93	74	17
	268	134	108	26	228	114	93	22
	311	155	124	31		137	110	26
	415	208	166	41		182	145	35

Three-Phase A.C. Motors

Induction, Squirrel-Cage and Wound Rotor Amperes				Synchronous Type †Unity Power Factor Amperes				
110v.	220v.	440v.	550v.	2300v.	220v.	440v.	550v.	2300v.
4	2	1	.8					
5.6	2.8	1.4	1.1					
7	3.5	1.8	1.4					
10	5	2.5	2.0					
13	6.5	3.3	2.6					
	9	4.5	4					
	15	7.5	6					
	22	11	9					
	27	14	11					
	40	20	16					
	52	26	21					
	64	32	26	7	54	27	22	5.4
	78	39	31	8.5	65	33	26	6.5
	104	52	41	10.5	86	43	35	8
	125	63	50	13	108	54	44	10
	150	75	60	16	128	64	51	12
	185	93	74	19	161	81	65	15
	246	123	98	25	211	106	85	20
	310	155	124	31	264	132	106	25
	360	180	144	37		158	127	30
	480	240	192	49		210	168	40

***These values for full-load current are for these conditions:**

D.C. motors—average for all speeds

A.C. motors—for motors running at speeds usual for belted motors and motors with normal torque characteristics. Motors built for especially low speeds or high torques may require more current, in which case the nameplate current rating should be used.

In addition, these modifications should be made:

2-phase—current in the common conductor of 2-phase 3-wire system will be 1.41 times value given.

1-phase—for full-load currents of 200 and 208 volt motors, increase 230-volt motor full-load current by 15% and 10%, respectively.

3-phase—for full-load currents of 200- and 208-volt motors, increase corresponding 220-volt motor full-load current by 10% & 6%, respectively.

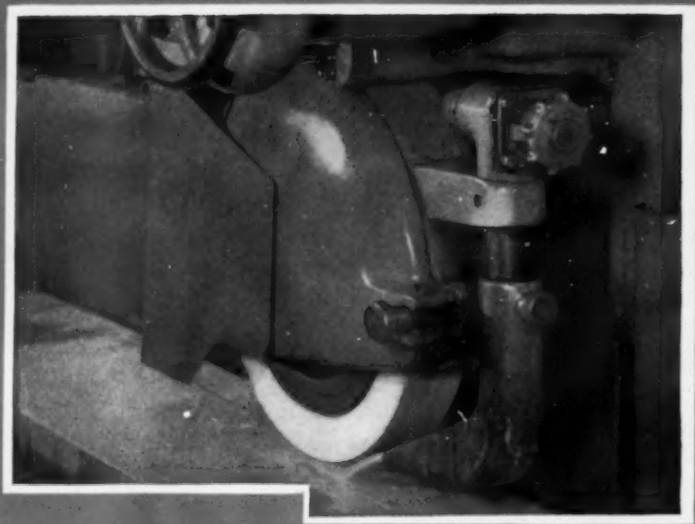
† For 90% & 80% power factor, figures should be multiplied by 1.1 & 1.25, respectively.

WIRE SIZES* for MOTOR CIRCUITS For Amperes at Full Load

Motor Rating, Amp.	1-12	13 & 14	15 & 16	17-20	22 & 24	26 & 28	30 & 32	34-40	42 & 44	46 & 48
Wire Size	No. 14	No. 12	No. 12	No. 10	No. 8	No. 8	No. 6	No. 6	No. 5	No. 4
Motor Rating, Amp.	50 & 52	54 & 56	58-64	66 & 68	70 & 72	74 & 76	78 & 80	82-88	90-96	98 & 100
Wire Size	No. 4	No. 4	No. 3	No. 2	No. 2	No. 1	No. 1	No. 1/0	No. 1/0	No. 1/0
Motor Rating, Amp.	105-120	125-140	145-160	165	170-180	185 & 190	195 & 200	210	220	230 & 240
Wire Size	No. 2/0	No. 3/0	No. 200	No. 4/0	4/0	250 M.C.M.	250	300	300	350
Motor Rating, Amp.	250 & 260	270 & 280	290	300	320	340 & 360	380	400	420	440
Wire Size	400 M.C.M.	500	500	500	500	600	700	700	800	800

*Rubber-insulated Wire

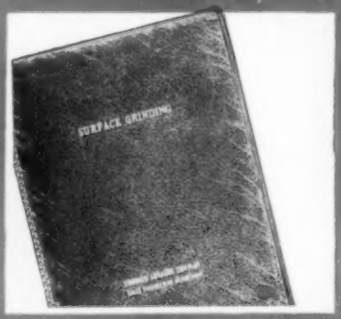
the grinding job



Horizontal surface grinding of alloy steel stock on a Mattison Precision Surface Grinder. Repeated precision results and a fine finish on a production basis make grinding wheel selection of prime importance.

the wheel

W Borolon vitrified, WA36-J8-V1, size 20" x 3" x 10" c/s one side 12¼" x ⅝"; c/s other side 12¼" x 1". Selected for cool, fast grinding without danger of burning stock. Efficient for grinding hardened and high speed steel; special alloys including high carbon high chrome types.



Borolon ALUMINUM OXIDE *Electrolon* SILICON CARBIDE

SIMONDS ABRASIVE CO.

PHILADELPHIA, PA.

Grinding Wheels

Complete line includes every shape and size.

Abrasive Grains

Mounted Wheels and Points

Surfacing Segments

Bricks and Sticks

where to get it

Simonds Abrasive Distributors in all principal industrial centers of the U. S. and in many foreign countries carry stocks and can advise on grinding wheel selection. Write today for Technical Manual on Modern Surface Grinding Practice. Also for name of nearest distributor.

SIMONDS ABRASIVE CO.
Philadelphia, Pa.
Electric Furnace Plant, Simonds Canada Abrasive Co., Ltd., Arvida, P.Q.

SIMONDS ABRASIVE COMPANY
is a division of
SIMONDS SAW AND STEEL CO.
Fitchburg, Mass.
Saws, Machine Knives, Files

Other Divisions

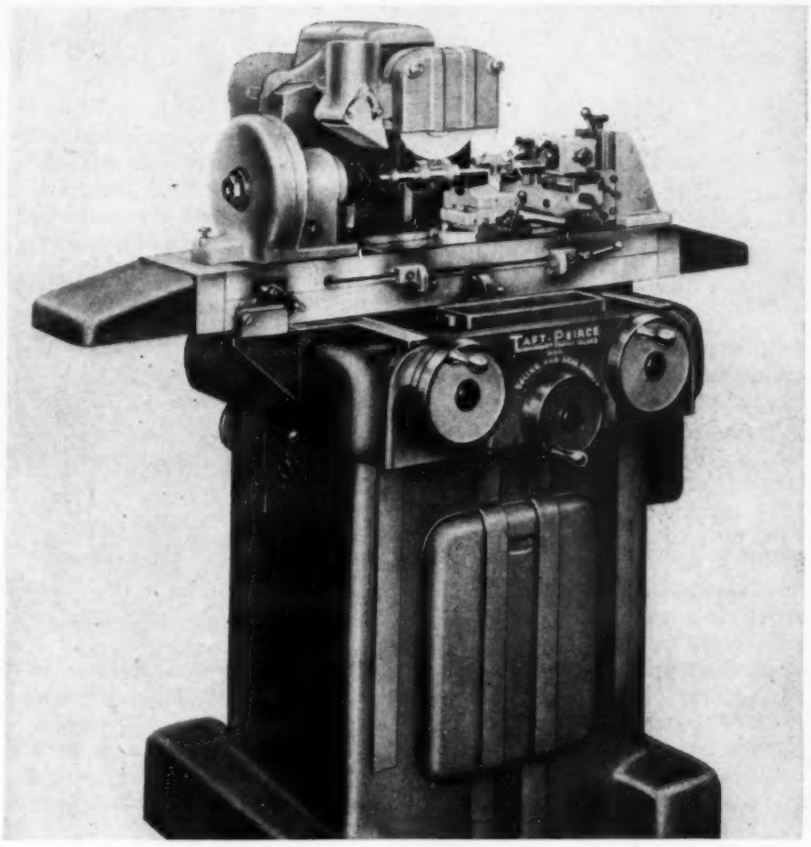
SIMONDS STEEL MILLS
Lockport, N.Y.
Special Steels

SIMONDS SAW CO. LTD.
Montreal, Can.
Simonds Products for Canada

Quality control has characterized Simonds Abrasive Company products during more than 50 years as a major manufacturer of grinding wheels and abrasive products exclusively. This control begins with the abrasive grain produced in modern electric furnaces by Simonds Canada Abrasive Co., Ltd., and extends to the finished wheels for all types of grinding from roughing to precision finishing. This means consistently high wheel performance on every grinding job.

SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA. • DISTRIBUTORS IN ALL PRINCIPAL CITIES

Shop Equipment News



Taft-Peirce Spline and Gear Grinder Takes 8-in. Arbor Between Centers

A semi-automatic grinder which produces small- and medium-size fine-pitch gears and splines to close tolerances has been announced by Taft-Peirce Mfg. Co., Woonsocket, R. I. Net clearance from the center line of the work arbor to the table surface is 4¼ in. There is enough distance between centers to accommodate an 8-in. arbor.

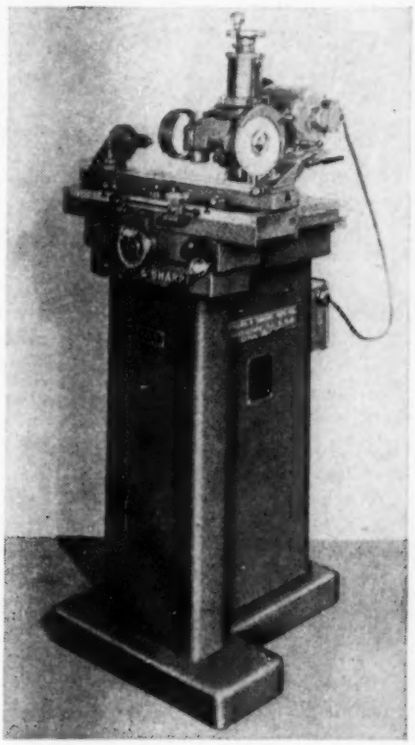
The grinder uses the same standard base, column and spindle head as the No. 1 precision surface grinder. A lever-operated tailstock permits quick removal of the arbor.

There is automatic indexing at the end of each stroke on the machine. Backlash and play are said to be eliminated by a special driving dog with clamping device, and by precision fits through the mechanism. Wheel dressing is accomplished with a three-diamond dresser, attached in line with the work arbor.

Saddle and table locks permit locking of cross or longitudinal travel when needed. The machine has a vibration-proof mounting said to greatly aid in precision and finish.

Surface Combustion Oil Standby Equipment Used with Gas Burners

Oil standby equipment for use with most of its gas-burner equipment has been developed by Surface Combustion Corp., Toledo 1, Ohio. The oil standby equipment utilizes No. 3 furnace oil (or lighter) which gives the same Btu. input per hr. as is provided with the gas burner equipment. The standby equipment can be quickly changed over during periods of gas curtailment.

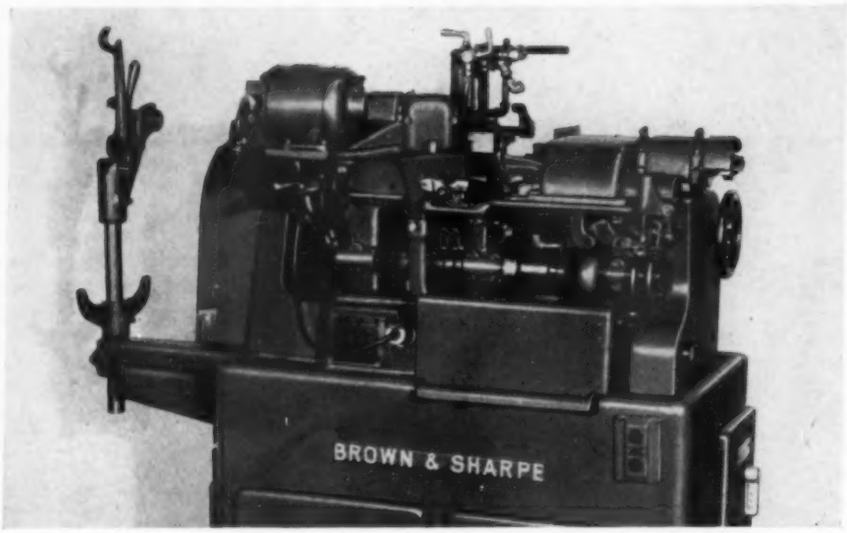


Brown & Sharpe No. 5 Grinder Sharpens Small Cutters, Tools

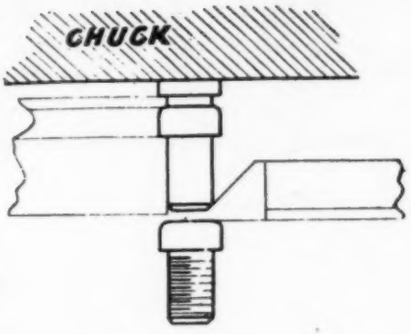
A cutter- and tool-grinding machine, No. 5, for handling toolroom sharpening jobs of the smaller class, especially end mills, is announced by Brown & Sharpe Mfg. Co., Providence 1, R. I. Sensitive design of the machine is said to make it responsive to light touch of operator.

Table slides on 36 precision-ground rolls. Unit has four-location table crank or knob. Center swing 6⅜-in. dia. Greatest distance from center line of work to center of wheel spindle is 8⅛ in.; least, 1⅝ in. The spindle-slide upright has 4½-in. transverse movement and 3-in. longitudinal adjustment. The wheel-spindle slide has vertical adjustment of 5½ in.

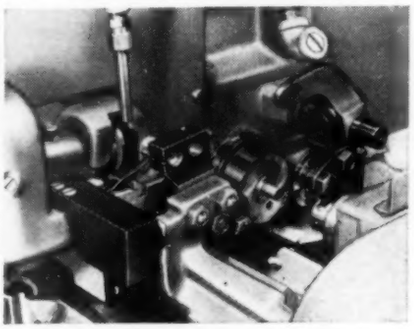
Automatic Screw-Threading Machine by Brown & Sharpe



With the use of available attachments, the machine can perform auxiliary operations in unison with main operations, making rehandling and the use of a second machine unnecessary to complete the screw



Principle of overlapping operations is shown in simultaneous tandem production of a screw. Threading and partial cutting off are performed on one piece, while initial operations are made on the succeeding piece



Close-up shows work spindle, die spindle and slotting mechanism

An automatic screw-threading machine has been developed by Brown & Sharpe Mfg. Co., Providence 1, R. I. It is said to give unusually high production of small screws, nuts and bushings because it is designed to take advantage of overlapping operations and reduce idle time.

Work spindle and threading spindle rotate in the same direction at different speeds. The difference in speeds permits the die or tap to cut at required threading speed, while the work rotates at sufficient speed for turning or other operations. Threading dies are backed off by automatic stopping of the threading spindle. Bushings are produced by using die spindle as a drill spindle.

The machine in general is similar to the design of the Brown & Sharpe automatic screw machines, with their latest improvements. There is a slotting mechanism to provide for slotting screws and similar work. When the machine is used for tapping, the slotting mechanism provides for drilling the hole prior to tapping.

There are 16 work-spindle speeds from 454 to 5000 rpm., and 32 threading-spindle speeds from 545 to 7000 rpm. This gives 32 changes of thread-cutting speeds, 91 to 2000 rpm. (the difference between speeds of work and speeds of threading spindles).

The machine handles stock to ⅜-in. dia., and threads any length to 1 in. The greatest distance from front of chuck to face of die is 2⅞ in.; the least is ⅛ in.

Cleveland Crane 500 Ton Press Incorporates Bed 20-ft. Long

The Cleveland Crane and Engineering Co., Wickliffe, Ohio, has added a 500-ton press featuring a bed 20 ft. long to the line of Steelweld bending presses. Known as Model Mo6-14, it has a ram which permits bending steel plate to 20 ft. × ⅜ in. or 14 ft. × ½ in. Horning operations are possible due to 21-in. bed extensions on each end. Bed extends 42 in. below floor.

The machine can be operated at either 7 or 20 strokes per min. and is equipped with tonnage indicators on both ends. A clutch knock-out mechanism disengages clutch when press is overloaded. Machine illustrated is treadle operated. Air-electric control is available.

LODGE & SHIPLEY LATHES

Earn "very good" rating

.... from NOTED ENGINE BUILDER

Lodge & Shipley Lathes are used to make "all types of tools and fixture parts" for the production of Diesel engines at the American Locomotive Company, Auburn, N. Y.

In the photo, a boring bar is shown being machined on a 20" Lodge & Shipley Engine Lathe, used for turning, boring, facing, and other typical operations in this plant. Heat treated tool steels are used . . . close tolerances are required.

Designed specifically to set new standards of accuracy, production and smooth operation, this lathe represents the ultimate in modern lathe design. Instantly selected threads and feeds, combined with a wide range of spindle speeds, allows the user complete freedom in obtaining maximum production.

Bulletin 503 describes and illustrates fully all the advantages of this lathe . . . new from headstock to tailstock.

ENGINE
TOOL ROOM
MANUFACTURING
OIL COUNTRY
DUOMATIC (AUTOMATIC)
LATHES
TURRET LATHES

THE Lodge & Shipley COMPANY

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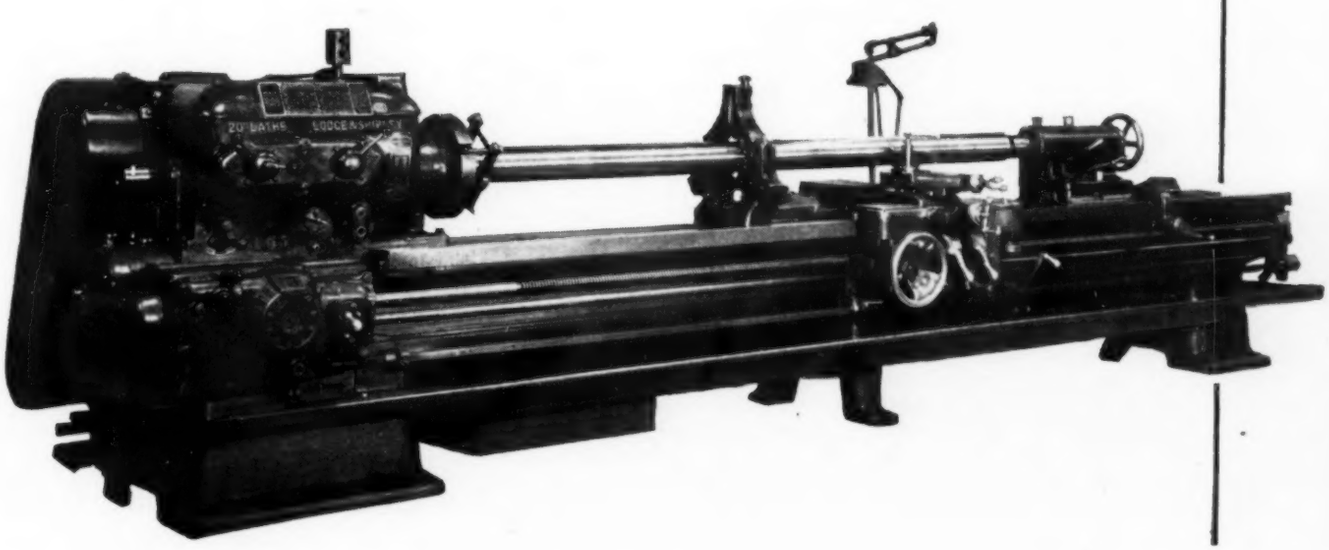
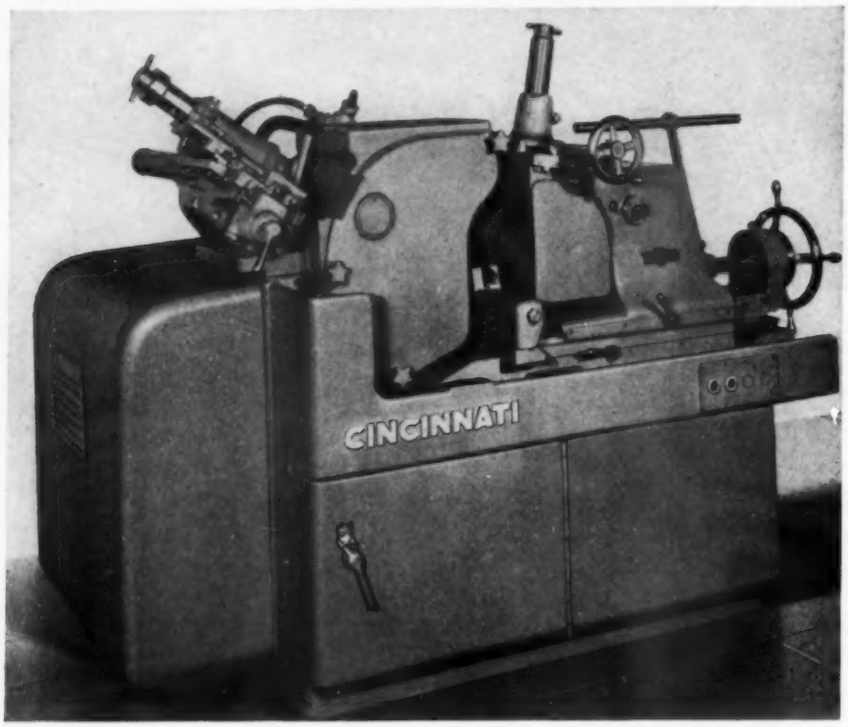
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO



Filmatic No. 2 Centerless Grinder Announced by Cincinnati



The Filmatic No. 2 centerless grinding machine has been announced by Cincinnati Grinders, Inc., Cincinnati 9, Ohio. It has improved features said to promote safety, facilitate setting up, and lengthen productive life.

The upper and lower slides supporting the regulating-wheel housing are mounted on an intermediate plate which has swivel adjustment through a trunnion mounting on the bed. This design facilitates setup because it permits the operator to swivel the slides and quickly compensate for slight inaccuracies in truing the wheel.

A large handwheel at the end of the machine adjusts upper and lower slides in relation to each other, or as a unit when clamped together. The dial of the handwheel has 250 graduations, approximately 0.090 in. apart, for clear visibility. A large lever near the handwheel is for operating the infeed screw clamp. Lubrication of the slide ways and infeed screw is through a built-in manual "one-shot" system.

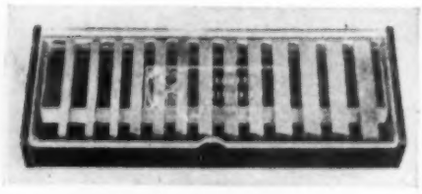
The regulating-wheel and grinding-wheel spindles are mounted on Filmatic multi-shoe bearings. The bearings consist of shoes or segments, pivoted to permit entrance of wedge-shaped oil films between shoes and spindle. The wedges are said to constitute a fluid vice that provides dead-center rotation under any load developed by grinding.

Electrical controls are built-in, protected by a hinged cover at the front of the machine. The latch handle of the cover serves as a disconnect switch. The other hinged cover on the front of the machine opens to the hydraulic-circuit motor mounted in the bed.

Other features include straight hydraulic grinding-wheel truing, with arrangement for cam-controlled profile truing. The regulating-wheel truing unit is manually operated, screw propelled, but can be replaced with a hydraulically operated unit, arranged for profile truing for some types of infeed work.

Regulating-wheel speeds are changed by lever-operated sliding gears, and there are 12 speeds from 12 to 300 rpm. The regulating-wheel drive is 1½ hp., and the main drive is 15 hp.

Capacity of the machine with standard workrests is 1/16- to 3½-in. dia. With low thrufeed workrest it is 2- to 4¾-in. dia. For types A and B bar-grinding fixtures, capacity is ⅛- to 1¼-in. dia.; with type C fixture it is ½- to 2-in. dia.



12 Toolbits in Three Grades Held in Redhard Precision Kit

Redhard Metals, Inc., North York Rd., Hatboro, Pa., announces the Redhard precision kit containing twelve toolbits in three grades of cutting metal. Kit is made of special plexiglas. Sizes of toolbits are from 3/16-in. square to ⅜-in. square for each grade. Grades are: Redhard Precision High Speed, Non-Ferrous and Precision Carbide. Kit also contains a special honing stick.

Portable Roller Gravity Conveyor Supplied in Sections 10-ft. Long

A reversible, portable, roller, gravity conveyor is made by Island Equipment Corp., 101 Park Ave., New York 17, N. Y. On one side the rollers are set high above the side rails, allowing the handling of packages that are wider than the frame. On the other side of the conveyor, the rollers are sunk below the level of the side rails, permitting conveying narrower items.

With the rollers in high position, cartons and cases to 24-in. wide can be carried. Legs are supplied in double-post type, with adjustable height units varying from 12 to 72 in. Sections are 10-ft. long and 90° curves. Width inside frame is either 14¾ or 16¾ in.

HYDRAULIC TRUCK, Wagnermobile Lift, heavy duty, is made by Mixermobile Manufacturers, 6855 N.E. Halsey St., Portland 16, Ore. Unit enables handling of 6,000 lb. to 8 ft., 4,000 lb. to 11 ft. It turns inside a 6¼-ft. radius. The cab model with track retracted is 6 ft., 8½ in. high and is powered by a Chrysler Industrial engine rated at 98 dynamic bhp. The unit weighs 7425 lb., is said to have excellent visibility

8 DRAWS-NO ANNEALS-MAKE MOTOR CASE

SEVERAL different types of Revere Metals go into the making of the famous Telechron Electric Clocks. They include copper, brass, and commercial bronze or "gilding metal." Each type is most carefully selected to match the strict requirements of fabrication and operation. In making those selections, and in working out the most favorable manufacturing methods, Revere and Telechron collaborated closely and effectively.

Take the motor case, which involves a deep draw in a relatively small part. The metal must not only be suited for this operation, but must be non-magnetic, since the lines of force from the motor's electromagnet must penetrate the case in order to operate the motor. Naturally, a copper alloy was indicated—but *which?* Telechron had eyelet-type press tools designed and built for the eight drawing operations. The Revere Technical Advisory Service was called in when unexpected production difficulties arose. Through a mutual study, these difficulties were entirely eliminated by specifying Revere Commercial Bronze, 95%, and by making other changes. No anneals are now required to produce the case. Production was stepped up, rejects reduced, marked economies obtained . . . Revere will gladly cooperate with any manufacturer faced with problems in the non-ferrous metals.

• • •

REVERE PRODUCTS: *Copper and Copper Alloys:* Sheet and Plate, Roll and Strip, Rod and Bar, Tube and Pipe, Extruded Shapes, Forgings. *Aluminum Alloys:* Tube, Extruded Shapes, Forgings. *Magnesium Alloys:* Sheet and Plate, Rod and Bar, Tube, Extruded Shapes, Forgings. *Steel:* Electric Welded Steel Tube.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

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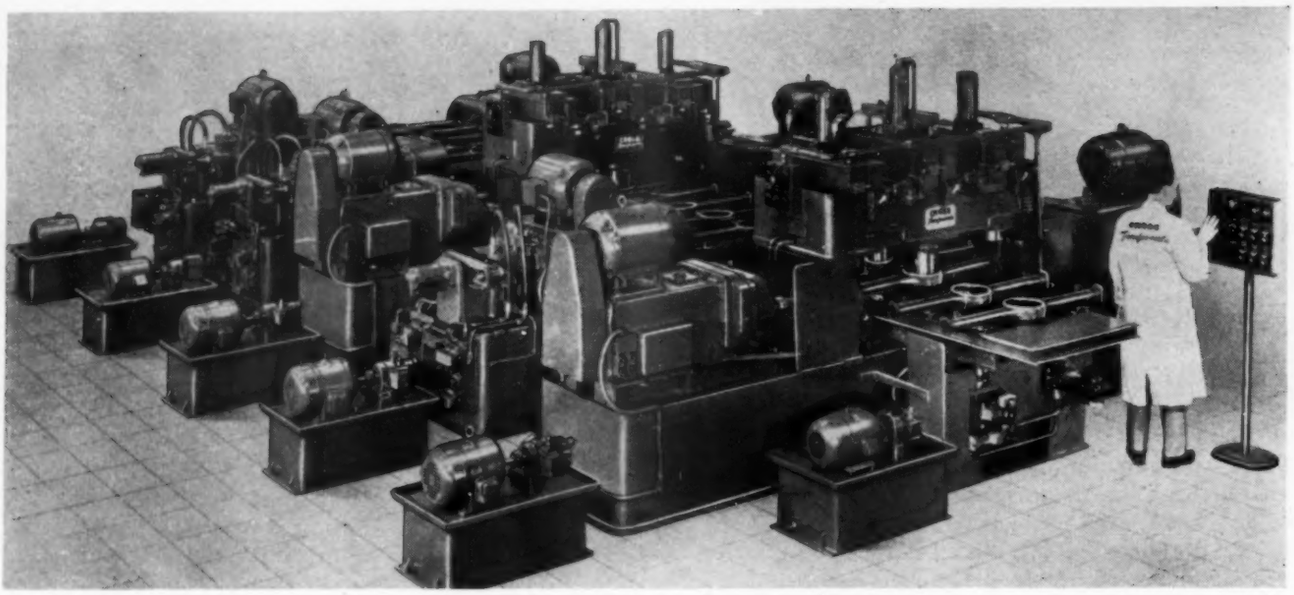
Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.

Sales Offices in Principal Cities, Distributors Everywhere

Telechron Kitchen Clock, Buffet Model, made by Telechron Inc., Ashland, Mass., motor, and progressive steps in manufacture of the motor case.



Over five miles of control wires go into the "hook-up" of this Transfer-matic

150 Axles per Hr. Machined by Cross Transfer-matic

A special machine tool, announced by The Cross Co., Detroit, Mich., produces 150 automobile rear-axle housings per hr. with only one operator. A Transfer-matic, it consists of five two-station double-end machines in combination with a transfer mechanism. Operations are rough and finish boring the wheel bearing seats, turning the outside diameter of the end flanges, turning the bolt clearance behind the end flanges, rough straddle facing and finish facing the end flanges.

In an automatic cycle, parts are picked up by the transfer mechanism, advanced from one machine to the next, located, clamped and machined. Twenty parts are transferred simultaneously. The transfer mechanism moves work from machine to machine only; locating and clamping are left to workholding fixtures integral with each machine. The mechanism returns to loading position during the machine cycle.

Each machine has its own electronic control panel. A sixth panel is provided for master control. A series of lights on the master tells when and where trouble occurs. All the operator has to do to run the machine is load parts and press the cycle-start button.

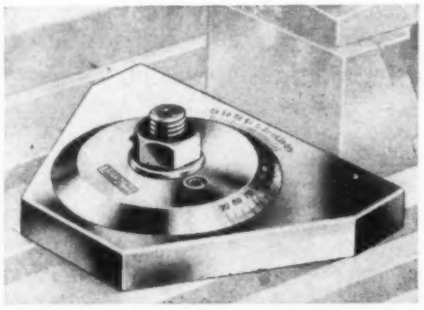
There are 32 cutting tools in operation simultaneously, and carbide tools are used wherever possible. Seventeen electric motors are required to drive all machines and pumps. Coolant and chips are handled through a centralized system located beneath the floor. An idle station between machines is for accessibility and removal of parts between operations if desired.

O'Neil-Irwin Di-Acro Notcher Cuts Plastics, Stainless Steel

The Di-Acro notcher, a flexible precision shearing unit, is introduced by O'Neil-Irwin Mfg. Co., 311 Eighth Ave., Lake City, Minn. Unit cuts notches in sheet materials and is said to eliminate necessity of dies.

Notches of 90°, as well as smaller or greater angles, can be cut in any size within the capacity of the machine. Many straight shearing operations also can be performed. A flexible gaging arrangement is said to allow a notch of desired dimensions to be exactly located. Action is obtained through a roller-bearing cam which distributes the shearing pressure simultaneously on both shear blades.

A triangular-shaped ram controls position of shear blades. Cutting range extends from light materials such as plastics, fiber, leather and rubber, to heavy gages of aluminum, cobalt steel, leaded brass and stainless steel. Notcher is adaptable to model, research and experimental work as it is said to provide the exacting tolerances required. Material capacity is 16-gage steel plate. Maximum 90° notch is 6x6 in.



MACHINE TABLE PROTRACTOR for obtaining an angular locating or working surface on milling machine or other machine tables is introduced by The Taft-Peirce Mfg. Co., Woonsocket, R. I. Graduated index plate includes vernier scale for accurate settings within 5 min. of angle. It accommodates standard-size tongues to fit conventional T-slots. Also can be made to fit special slot requirements

A DOUBLE SAVING with SCULLY-JONES Style A TAP CHUCKS

① Reduce tap breakage and time lost for changing.

② Speed up production by quick insertion and ejection.

See pages 25, 26, 27, Scully-Jones Catalog No. 500

*In a standard spindle with a Morse Taper Hole

*In Scully-Jones Floating Holder

*In Floating Tension Type Tap Driver for Magic Chuck

*In a Magic Quick Change Chuck

*In a Spring Compression Tap Driver

Universally used for individual or modern mass production, the Scully-Jones Style "A" tap chuck is a one-piece tool designed for driving taps in any type of machine having a spindle, holder or attachment with a Morse taper hole.

True-running, definite stop, positive drive, smaller in diameter than spindle, quick insertion and easy ejection, are advantages that reduce tap breakage and speed up production.

Write for our complete listing of sizes.

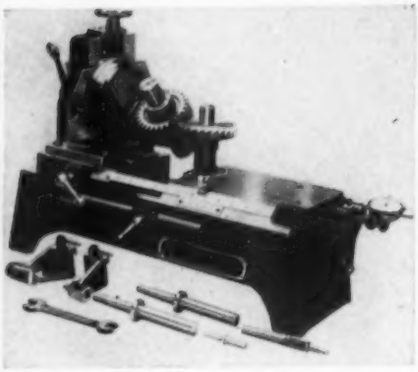
5 Big FEATURES

STYLE "A" TAP CHUCKS

1. Drives By Square—a positive drive
2. Centers By Shank—for correct alignment
3. Collet Action—locks tap in chuck
4. Taper Shank—fits any M.T. hole
5. Four Point Bearing—gives collet action

Scully-Jones AND COMPANY

1902 SOUTH ROCKWELL STREET • CHICAGO 8, U. S. A.



Redesigned Parkson Gear Tester Incorporates Adjustable Stop-Rod

George Scherr Co., 200 Lafayette St., New York 12, N. Y., has announced the redesigned 9-in. Parkson gear tester. It now incorporates an adjustable stop-rod in addition to the precision scale and vernier which are used for setting of center distance.

When a number of gears of the same size are to be tested, it is no longer necessary to repeat the scale setting. Instead, stop-rod is set and clamped in position. To change setup, left-hand slide is moved out of the way, gears on arbor are replaced and slide is then brought into original position against stop.

Machine is available for spiral, spur, bevel, and worm gears, either in combination or single-purpose models.

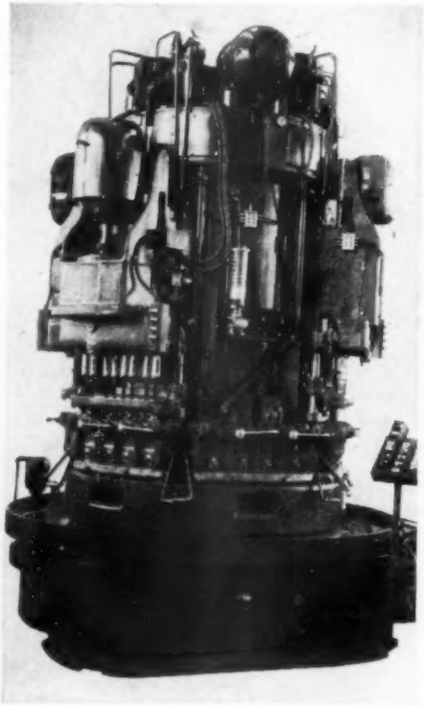
Chemical Cleaner by Hartman Eliminates Flues, Ventilators

A portable electrically heated chemical cleaner for on-the-spot indoor cleaning of industrial machinery, conveyor systems and other equipment, as well as automotive maintenance work, is introduced by Hartman Corp. of America, 5147 Natural Bridge Ave., St. Louis 15, Mo.

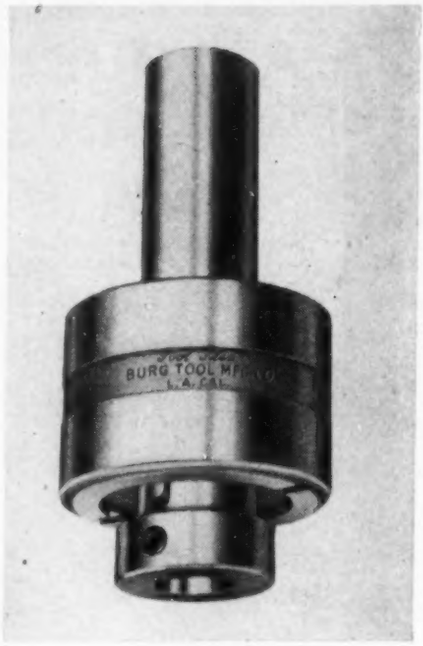
Smokestacks, flues and ventilators are eliminated. The constant-pressure anti-splash nozzle automatically regulates spray pattern for high-temperature cleaning and creates a high-powered pulsating stream of atomized super-heated water and chemical solution. Also featured is a ceramic core boiler fitted with immersion heater that is said to heat water from tap temperature to operating temperature in approximately one minute.

Cleaner occupies less than 2-ft. square of floor space, and has 20-ft. Neoprene hose. A rubber cable provides an 80-ft. working area.

Hartman also announces two chemical cleaning compounds, which require no water softeners, for use with their cleaner: Hi-Power flakes, soluble in hot or cold water, for removing heavy accumulations of grease, dirt and muck; and Lo-Power granular cleaning compound for lighter work.

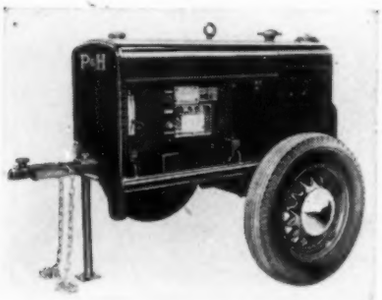


SPECIAL MACHINE for drilling, reaming and counterboring automobile-engine connecting rod and caps is made by Sommer and Adams Co., subsidiary of The Federal Machine and Welder Co., Warren, Ohio. Machine produces over 240 assemblies per hr. with a single operator, has five stations, an automatic cycle, and push-button control. Workpieces, broached before being brought to machine, are worked four at a time at each station. Machine is over 11 ft. tall and weighs 36,000 lb. It is supplied with an automatic lubrication system



Burg's Flexible Toolholder Features Neoprene Mounting

Tool-Flex Neoprene-mounted, non-releasing, pull-out type, flexible toolholder for use when tapping on screw machines is manufactured by Burg Tool Manufacturing Co., Dept. AM, 5028 W. Jefferson Blvd., Los Angeles 16, Calif. Neoprene mounting is said to prevent binding, absorb shock, keep taps on center and permit them to follow original hole, and eliminate tap breakage due to misalignment. Pull-out action of holder is said to compensate for difference in cam motion and tap travel when backing out. Short overhang is incorporated on small sizes for short-clearance machines.



PORTABLE ARC WELDER, P&H Model WN-200, is now featured with extra power supply offered as optional equipment. It is made by Harnischfeger Corp., Welding Div., 4400 W. National Ave., Milwaukee 14, Wis. The supply provides 1½-kw. ac. at 115 v., single phase. It permits use of electric lights and any universal ac.-dc. portable tool from this source

For Speedier Assembly, Smarter Appearance...

Postage Meter and Mailing Equipment Makers Put the Stamp of Approval on AMERICAN PHILLIPS SCREWS

IN PRODUCTION: It's *first class* assembly for mailing and metering equipment manufacturers when power driven, American Phillips Screws provide fumble-proof starts, *automatically straight* driving and unspoiled work. These screws deliver—with "air mail speed" and "registered letter safety"! What's more, they *can't* snag envelopes but *do assure* permanent tightness of fastening. Best of all, TIME SAVINGS RUN AS HIGH AS 50%!

IN SALES PROMOTION: The jobber, the dealer and John Q. Public *all* like the streamlined, modern look that dresses up products as varied as autos and radios, stoves and sofas, boats and bicycles — and American Phillips Screws help provide it! Write *special delivery* today for fastening facts that can cut *your* costs.

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

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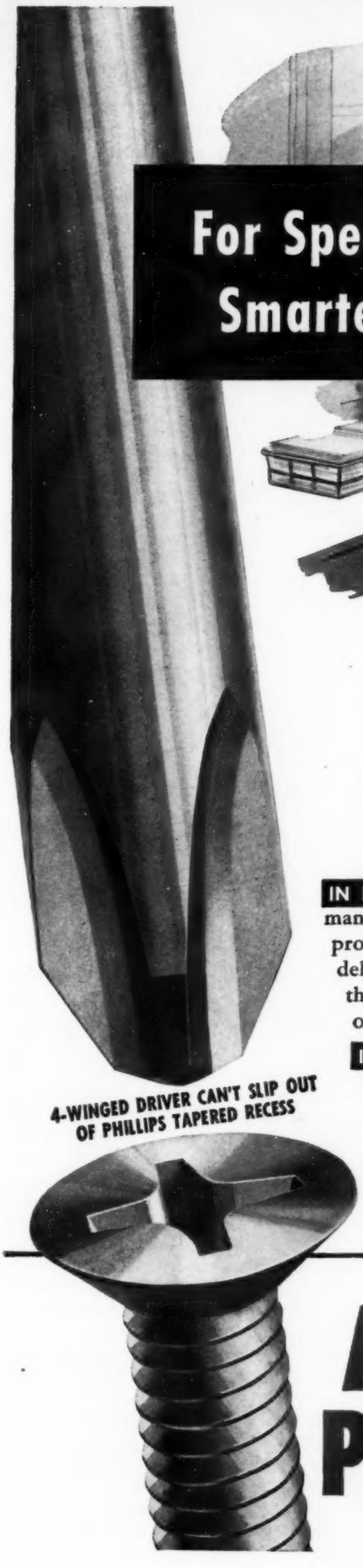
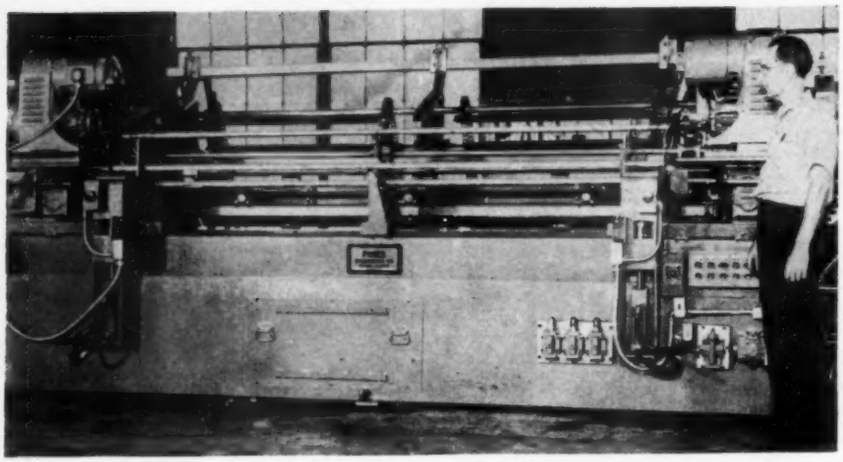


4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)



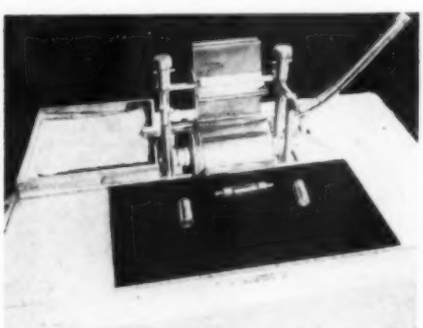
End Machining of Tubes and Bars Done by Pines Profiling Machines

Automatic profiling machines for high-production end-machining operations are offered by Pines Engineering Co., 653 Walnut St., Aurora, Ill. Used for turning, boring, chamfering, burring, threading, tapping and other operations on ends of pipe, tubing, bars and similar work, machines are built for either manual or automatic operation.

Machine chamfers both ends of ½-in. conduit, 10-in. long, at the rate of 800 to 1000 pieces per hr. Same machine will simultaneously chamfer both ends of screw-machine rod stock at rate of 700 to 900 pieces per hour.

Automatic types are equipped with hydraulic controls for continuous repetitive operation. Either one or two heads are employed on machines, the latter permitting simultaneous machining of both ends of the work. Machines handle lengths from less than 1 in. to 60 ft.

Chute or magazine-fed machines are used for lengths to 24 in.; reel-fed machines for work in lengths over 24 in. For a combination of the two capacities, a single-spindle machine works one end at a time. Profilers can be equipped with conveyors for automatic arrangement eliminating in-process handling.



Feed Adjustment by Size Control For Centerless Lapping Machine

An automatic feed attachment is offered by Size Control Co., Div. American Gage & Machine Co., 2500 Washington Blvd., Chicago, Ill., for use with their centerless lapping machine.

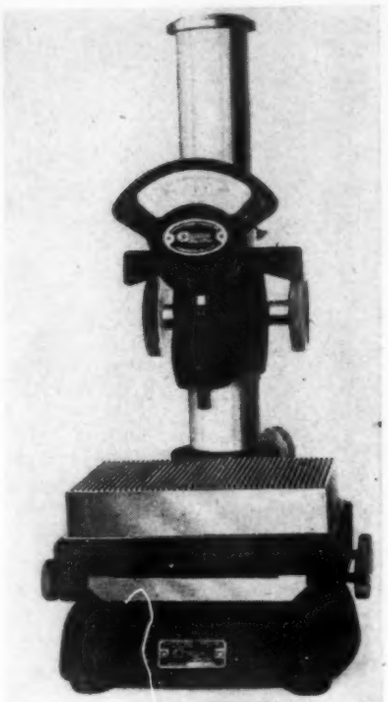
Feeding, holding and ejecting are automatic. Cylindrical pieces feed in between lapping rolls and are lapped to a finish of less than 2 micro in. Adjustable spring tension on the holding applicator determines pressure to be applied to cylindrical pieces as they are lapped. When one of the holding vanes becomes gummed with lapping compound and other material, a clean vane can be rotated into working position.

Illustration shows cylindrical pieces in feed chute at right, four-vaned holding applicator holding pieces between lapping rolls in center, and the finished pieces being ejected at left.

Inclosed Thermocouple Line Constructed for Foundry Use

A line of inclosed thermocouples for general foundry use is introduced by The Industrial Instrument Service Co., 2785 E. Slauson Ave., Huntington Park, Calif. Called Thermo-Tips, they are constructed in one piece in any length or shape. Increased lengths bring connecting junction outside retort.

Thermo-Tips come in standard 18- and 24-in. lengths, straight or with 45° or 90° bends, using 16-gage matched chromel-alumel elements. Shorter lengths are available. For extreme sensitivity and rapid temperature indication, matched thermocouple wires of 20-gage size or of iron-constantan can be supplied.

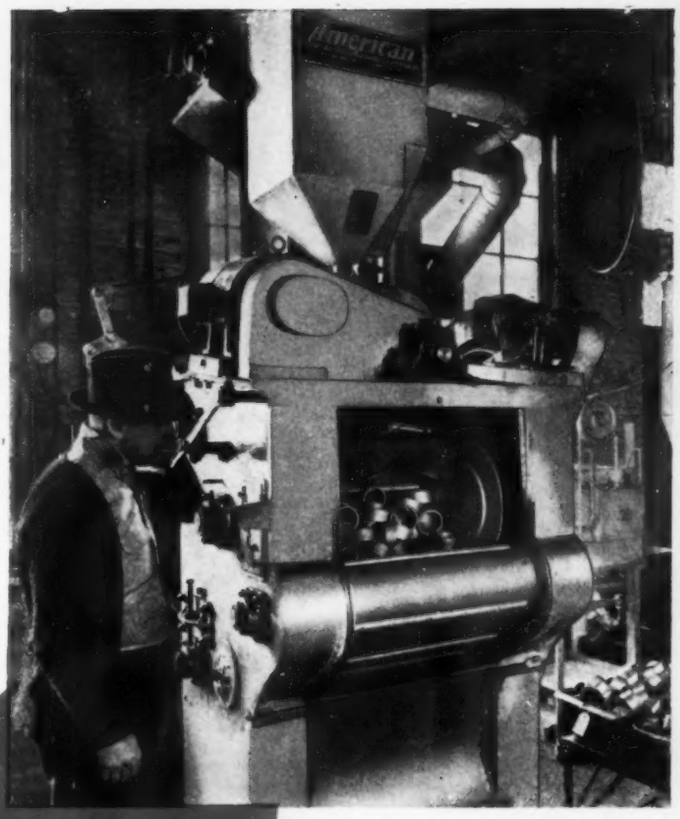


Standard's Model 108 Comparator Permits Interchangeable Tables

Model 108 comparator is introduced by Standard Gage Co., Poughkeepsie, N. Y. Provision is made for five interchangeable tables and the use of standard indicators, allowing a wide range of production and inspection measuring jobs. When equipped with the Micronar Indicator, it allows simple checking of plug gages.

Any AGD dial indicator of No. 2 or 3 size, having standard lug-type back, can be used. Therefore an indicator with graduations near accuracy desired can be mounted on comparator. Fine adjustment is effected by a wing handle. Knurled bushing regulates pressure of contact point on work. A reed mechanism within the head prevents side thrust from reaching the indicator. Tables available are: 1½x4 in. serrated, 6x4 in. serrated, 1½x4 in. plain, and one with 1½-in. dia. rolls which is used for checking lobal conditions.

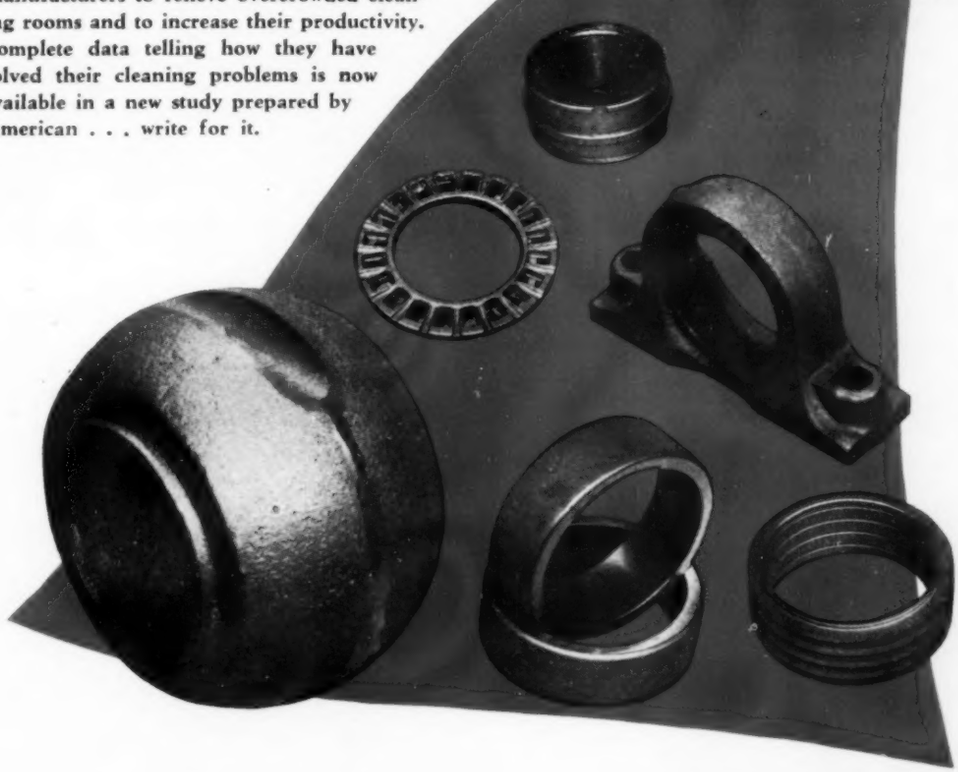
Wheelabrator's thorough cleaning helps to speed production in the BEARING INDUSTRY



The torrent of abrasive, hurled by the Airless Wheelabrator, scours every surface brilliantly clean in but a few minutes. Loads of bearing castings that formerly required 30 minutes to three hours for cleaning by other methods are now cleaned by the Wheelabrator in 4 to 12 minutes. For example:

At the Heppensall Co., Bridgeport, Conn. a Wheelabrator Tumblast cleans 200 inner races for S.K.F. and Hyatt bearings in 8 minutes. This work previously required 4½ hours by hand in a sand blast room.

The amount of time and labor saved through the use of a Wheelabrator has enabled Bearing Manufacturers to relieve overcrowded cleaning rooms and to increase their productivity. Complete data telling how they have solved their cleaning problems is now available in a new study prepared by American . . . write for it.



TYPICAL USERS

Aetna Ball Bearing Co.
Bower Roller Bearing Co.
Bantam Bearing Div.
Canadian Bronze Co., Ltd.
Cleveland Graphite Bronze Co.
Dodge Mfg. Co.
Fafnir Bearing Co.
Hyatt Bearing Div.
Fischer Foundry Div.
Bound Brook Oil-less Bearing Co.
Kaydon Engineering Co.
Marlin-Rockwell Corp.
McGill Mfg. Co.
Link Belt Co.
Magnus Metal Division
National Bearing Metals Div.
Nice Ball Bearing Co.
S. K. F. Industries
Spicer Mfg. Co.
Timken Roller Bearing Co
Norma-Hoffman Bearing Corp.
Arnold, Schwinn & Co.
Tyson Roller Bearing Co.
Andrews Co. . . Bearing Div.
Bunting Brass & Bronze Co.
Johnson Bronze Co.
Ford Motor Co.
Roller Bearing Co. of America
Burgess Norton Mfg. Co.
Toronto Foundry Co.

Write for our latest treatise "CLEANING PROBLEMS SOLVED In the Bearing Industry". Contains complete case history data, and a wealth of other material applicable to the Bearing Industry.

American
WHEELABRATOR & EQUIPMENT CORP.
(FORMERLY AMERICAN FOUNDRY EQUIPMENT CO.)
317 S. Byrkit St., Mishawaka 6, Indiana

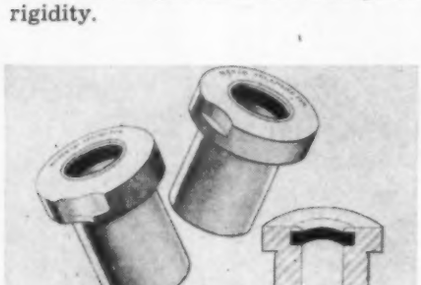
Blades, Locks on E-Con-O-Mill Fit All Sizes of Cutter Bodies

A carbide face mill in standard sizes of 5-in. dia. and over is announced by The Gairing Tool Co., 21221 Hoover Rd., Detroit 32, Mich. Known as the E-Con-O-Mill, the same blades and locks fit all sizes of cutter bodies.

The cone-type bodies give full-height support to the blades and allow unobstructed chip clearance. Individual blades can be replaced without regrinding entire cutter as slots are cut to close tolerances.

Square toolbit-type blades are furnished with clearance angles ground to a gage, and may be resharpened on a wet carbide grinder. Blades are made in three types, with different radial rakes for steel, cast iron, and non-ferrous materials.

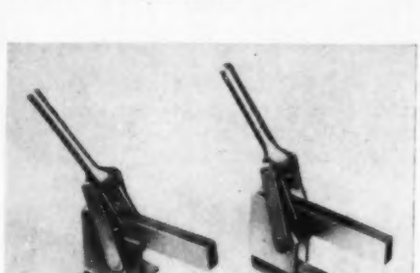
Locks are assembled in one piece. When changing blades, they remain attached to body. Positive locking wedge and compound angle on blade are said to provide true one-piece rigidity.



Meyers Meyco Drill-Jig Bushings Have Tungsten-Carbide Inserts

A standard line of Meyco carbide-inserted drill-jig bushings has been developed by W. F. Meyers Co., Bedford, Ind. A tungsten-carbide insert at the two points of wear is said to insure longer life and greater accuracy.

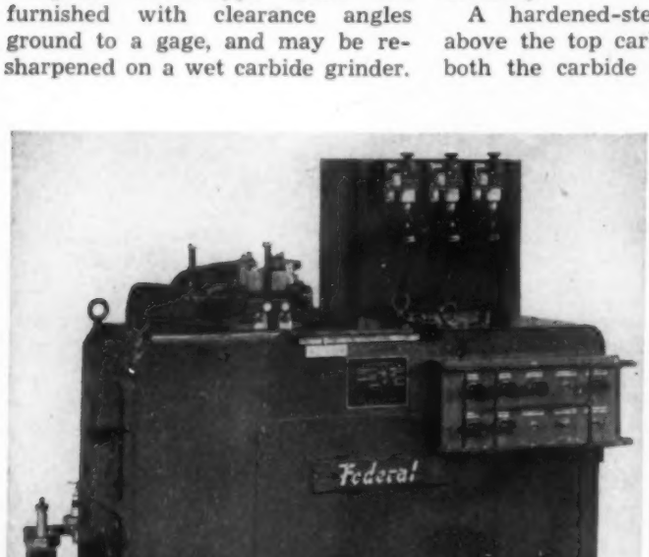
A hardened-steel ring inserted above the top carbide ring protects both the carbide and drill against shock of impact, thus retaining the qualities of a hardened-steel bushing with the advantages of tungsten carbide at points of wear.



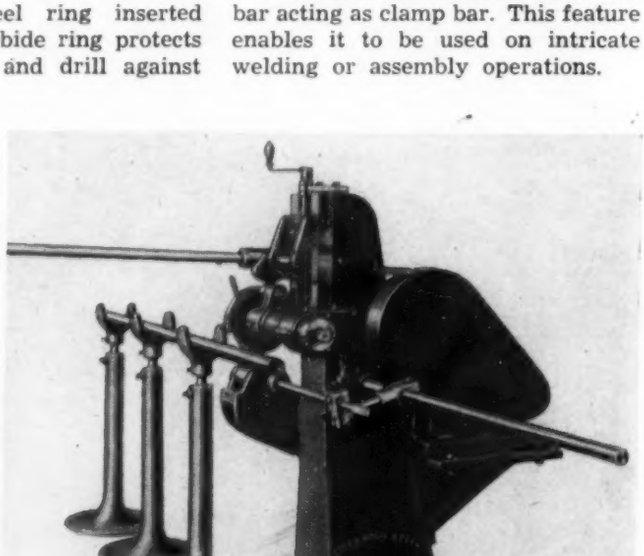
Pivot Pins Welded to Frame On Heavy-Duty Toggle Clamp

An all-welded heavy-duty toggle clamp designed to withstand severe service is offered by General Welding Co., 7404 Euclid Ave., Cleveland 3, Ohio. All pivot pins are welded to the frame and linkage, making a rigid unit.

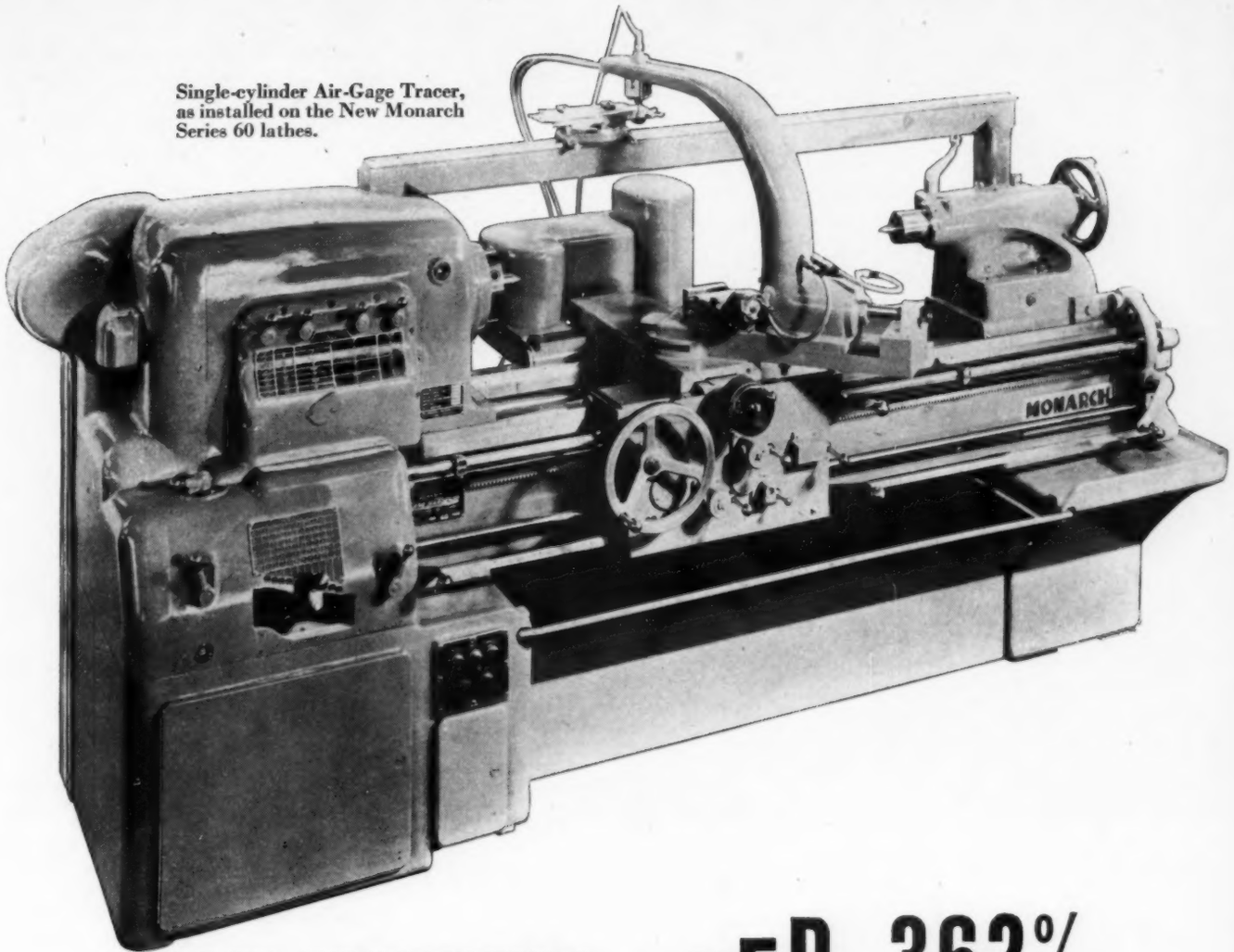
Illustrated, left, is Model A-2, useful on drill jigs, milling fixtures, and similar units. On the right is Model B-2 which can be used with either bar acting as clamp bar. This feature enables it to be used on intricate welding or assembly operations.



FLASH WELDER, type F-1, for welding flat mild-steel stock with a maximum width of 3 in., or for round and flat mild steel with a maximum cross-section of 0.17 sq. in., is made by The Federal Machine and Welder Co., Plant 2, Warren, Ohio. Platen size is 12x12 in. Machine is equipped with air-operated vertical clamps and adjustable upper and lower dies. Operation is automatic or semi-automatic. 20 kva. transformer is supplied



PIPE AND TUBE CUTTER, Steen high-speed, is introduced by Continental Machine Co., 1952 Maud Ave., Chicago 14, Ill. Unit is made in three sizes, Nos. 3, 6 and 12 for cutting pipe or tubes of diameters from ½ to 3, ½ to 6, and 3 to 12 in. respectively. An attachment is available for cutting ⅛ to ½ in. dia. pipe for the Nos. 3 or 6 size. On Nos. 3 and 6 cutters, the gage works automatically with the cutter arm reducing friction on gage



Single-cylinder Air-Gage Tracer, as installed on the New Monarch Series 60 lathes.

SHAFT PRODUCTION UPPED 362%

With the New Monarch Air-Gage Tracer

Production time was cut from 174 hours down to 48 hours—for a large and representative lot of shafts.

This manufacturer's savings in time through the use of the Air-Gage Tracer is typical—as are the other savings made in this installation. Here's the story:

Shafts ranging in diameter from 3" to 4½" had been turned on modern manually-operated lathes, leaving .015" to .020" of stock for the grinding operation. Air-Gage Tracing holds diameter so closely (.002" on the average) that the stock left for grinding was cut in half. Grinder costs decreased, too.

Here's the payoff. Two Air-Gage Tracer equipped machines replaced five manual machines for this manufacturer—and they're out-performing the original battery, with more production—of far higher quality.

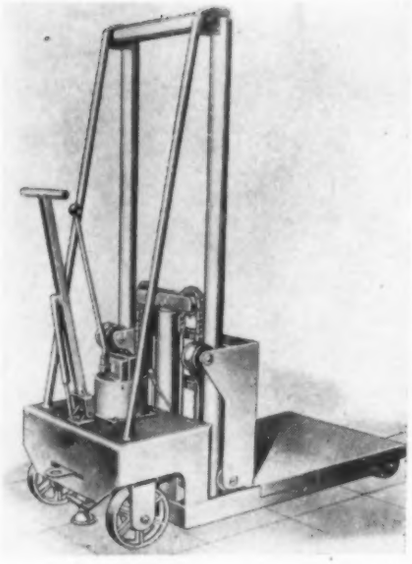
Let us show you how these modern Monarch Air-Gage Tracer equipped machines can cut your costs on shaft work and turned or bored contours and tapers.

THE MONARCH MACHINE TOOL COMPANY • Sidney, Ohio

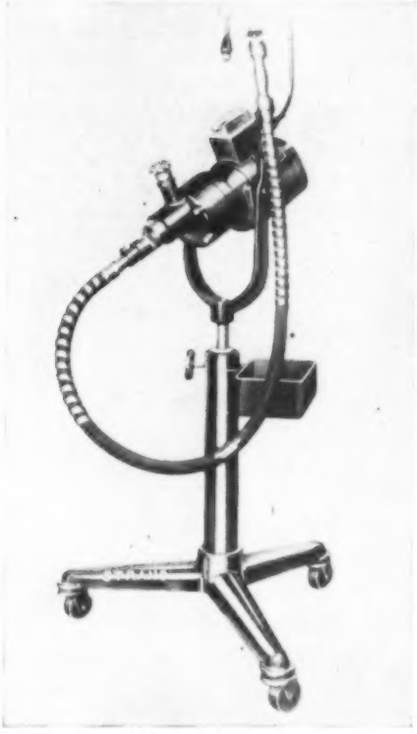
ACCURACY - ECONOMY - LONG LIFE

Monarch TURNING MACHINES

FOR A GOOD TURN *FASTER*—TURN TO MONARCH



HIGH-LIFT TRUCK with four-wheel suspension, auto steer, towing eye, and 3000-lb. capacity is made by Lyon-Raymond Corp., 4230 Madison St., Greene, N. Y. The 30x36-in. platform is supported by concave rollers fitted to the 83-in. high tubular uprights. Platform has a range of elevation from 6 to 54 in.



Strand's Rotoflex Machine Available with Four Speeds

The Rotoflex four-speed gear-drive flexible-shaft machine is announced by N. A. Strand & Co., 5001-09 North Wolcott Ave., Chicago 40, Ill. The Rotoflex drive features two sets of helical-cut hardened-steel gears, running in lubricant. Using an eccentric driving-shaft sleeve assembly, one or more master gears may be engaged by a slight rotary motion. Axial movement of sleeve for different speeds is also accomplished. The ball-bearing electric motor is totally enclosed.

Standard Rotoflex machines are available with speeds of 850, 1800, 3600, and 4500 rpm. High-speed Rotoflex machines using a 3450 rpm. electric motor, have speeds of 1700, 3600, 7200 and 9000 rpm.

The Rotoflex flexible-shaft equipment, with available attachments that can be interchanged for diversification of operations, can be used for grinding, buffing, polishing, sanding, drilling, and other jobs.

Covel's No. 7 Surface Grinder Equipped with Precision Spindle

A hand-feed surface grinder is offered by Covel Mfg. Co., Benton Harbor, Mich., for grinding tools, dies, chip breakers, and other toolroom jobs. Called Excel No. 7, the machine is equipped with precision ball-bearing spindle and hardened spiral pinion and rack. Convenient grouping and location of controls is said to offer accessibility from any working position. Method of control enables handling small odd-lot jobs.

Ways are dust-protected and motor is enclosed in base away from grinding dust. There are no dogs or feeds to set or adjust. Machine is furnished either as bench or floor type with wet-grinding attachment available.

Working surface is $5\frac{5}{8}$x$10\frac{3}{8}$ in.; longitudinal travel, 12 in.; cross travel, $6\frac{1}{8}$ in. Size of grinding wheel is 7x½x1¼ in.; floor space is 36x44 in. Height under wheel is 9 in. Unit has ½-hp. motor.

Trindl's Limited-Input Welders Used on Single-Phase Power Lines

Improved, general-purpose, limited-input transformer-type welders have been added to the Job-Tested line of welders manufactured by Trindl Products, Ltd., 17 East 23rd St., Chicago 16, Ill. For use on single-phase, rural and other limited-capacity power lines, they conform with both REA and NEMA specifications. Machines are available with and without power-factor correction in output ratings of 130 and 180 amp.

Listed as 130B, 130C and 180B and 180C, they have 36 secondary output-current heat stages ranging from 20 amp. to their rated maximum secondary outputs of 130 and 180 respectively. Welders feature sloping vernier-type control panel.

EutecRod 188 for Gas Welding Gives 67 Rockwell C Hardness

A gas-welding rod, known as EutecRod 188, with a maximum hardness to 67 Rockwell C, is announced by Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y. In a single pass, it produces overlays on copper which are said to require no additional heat treatment.

The alloy has a bonding temperature of 1800 F. and remelts at 1950 F. In addition to producing overlay hardness on copper, it is applicable to steel and ferrous metals generally, without dilution with base metal during the welding process.

"$5.00 a day for mechanics? ...the man is mad!"

● Thirty-four years ago, a famous industrialist announced a five-dollar minimum daily wage. Industry was dumbfounded! How could a man pay such high wages and still make a profit? *But he did . . . by cutting corners* in production, he built an industrial empire!

Today, rising labor and material costs are pushing *your* "break-even" point to unheard-of percentages. *Your* future profits—even survival—can well depend on *how you cut production corners.*

That is where Tinnerman SPEED NUTS can help you. No matter what you manufacture, there is a very good possibility that you can begin to cut cost and time corners in assembly operation with SPEED NUTS. (Incidentally, the same company that introduced the five-dollar wage 34 years ago now uses SPEED NUTS to save millions of dollars annually.)

Without obligation our engineers will be glad to examine your product and report to you the savings in costs you can expect through the use of SPEED NUTS. In the meantime let us send you our new descriptive catalog.

TINNERMAN PRODUCTS, INC.
2038 FULTON ROAD • CLEVELAND 13, OHIO

In Canada: Dominion Fasteners Ltd., Hamilton
In England: Simmonds Aerocessories, Ltd., Treforest
In France: Aerocessoires Simmonds, S. A., Paris

TINNERMAN

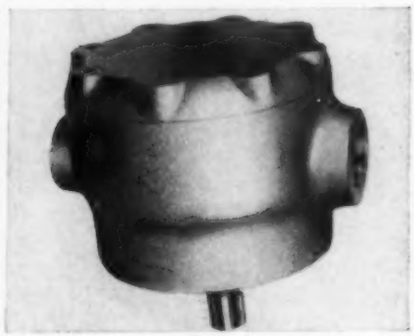
The SPEED NUT principle is incorporated in a complete system of fastenings for metallic and non-metallic parts. The savings are the result of fewer parts, faster application and the elimination of many preparatory operations. Special SPEED NUTS are made when existing SPEED NUTS do not meet all requirements.

Speed FASTEST THING IN FASTENINGS *Nuts*

Patented — Trade Mark Reg. U. S. Pat. Off.

THERE'S A SPEED NUT FOR EVERY FASTENING NEED—MORE THAN 4000 SHAPES AND SIZES

Parts and Materials



Sundstrand Pump in Three Sizes Is Constant-Displacement Type

A constant-displacement, hydraulically-balanced pump designed and tested for continuous duty at 1000-psi. operating pressure, is introduced by Sundstrand Machine Tool Co., Hydraulic Div., Rockford, Ill. Pressures to 1500 psi. can be utilized for intermittent service.

Pumps will be available in capacities ranging from 2 to 75 gpm. with three sizes covering the complete range. Interchangeable cartridges make possible four capacities within each basic size. The intermediate size in four capacities of 10, 13½, 20½, or 27½ gpm. at 1000 psi. is available at present. Multi-porting connects all pumping areas to assure unrestricted flow.

Kennametal Grade K138 Metal Resists High Temperatures

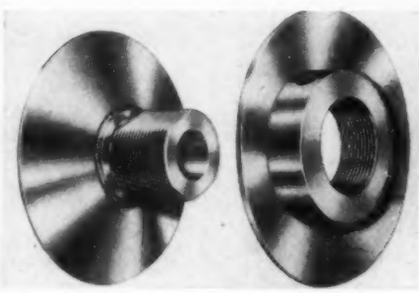
Kennametal Inc., Latrobe, Pa., announces a hard metal that is said to retain its strength and resistance to corrosion at high temperatures. A cemented-carbide composition, it has a specific gravity about 1/3 that of tungsten carbide, and 2/3 that of steel. Called Grade K138, it consists of titanium carbide with cobalt as a bonding element.

Made in accordance with Kennametal's processes of powder metallurgy, the metal can be formed into many shapes and sizes. It is suitable for high-temperature structures, such as furnace parts. Pieces of the metal, it is claimed, have been heated to 2100 F. for 48 hr. without loss of strength.

Rubber Tubing Made by Ronaflex Protected by Wire-Braid Cover

Flexible tubing said to have the flexibility of rubber and the sturdiness of steel is produced by Ronaflex Tubing Co., Inc., and is distributed by Peneflex Sales Co., 7200 Powers Lane, Philadelphia 42, Pa.

Said to withstand 980-psi. pressure, it can be bent and twisted, yet provides free-flowing transmission of air, water, gases, oil and volatiles. Rubber tubing is protected by steel wire-braid cover.



Dodge's Variable-Pitch Sheaves Made in Range of Pitch Diameters

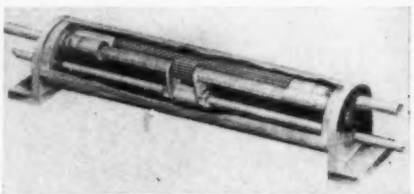
A solid-steel fractional-horsepower variable-pitch sheave, providing finer adjustment through use of 20 threads, is announced by Dodge Mfg. Corp., Mishawaka, Ind. It is made in a range of pitch diameters from 1.9-2.9 in. to 3.4-4.4 in. in four sizes using No. 2 fhp. belts, and from 2.4-3.2 in. to 3.7-4.7 in. in four sizes using No. 3 fhp. belts

All sizes are available in three standard bores, namely, ½ in., ⅝ in. and ¾ in. The ½-in. sheave is provided with setscrew only, while the other two sheaves have both keyway and setscrew.

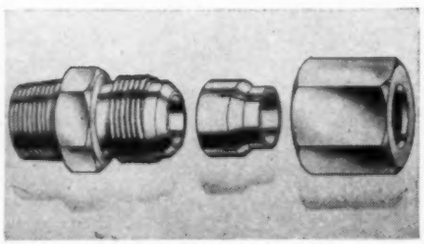
Cutter Dermesthetic Ointment Developed for Industrial Rashes

Cutter Laboratories, Fourth and Parker Sts., Berkeley 1, Calif., introduces Dermesthetic Ointment for industrial rashes, itching of poison oak, poison ivy and other pruritic conditions. It combines benzyl alcohol, phenol and benzocaine to obtain triple-action anesthetic control of itching.

The three ingredients are combined in a greaseless medium. It is said to retard the spread of grease-soluble irritants, such as rhus toxins and certain oil-soluble industrial materials.



SYNCHRONIZER is completely enclosed and is designed to provide absolute synchronization between two sources of power. Made by Taber Associates, 60 East 42nd St., New York, N. Y. By addition of extra pinions, any number to six power sources can be synchronized. Unit operates in oil bath, may be overridden by manual control, and weighs 3 lb.

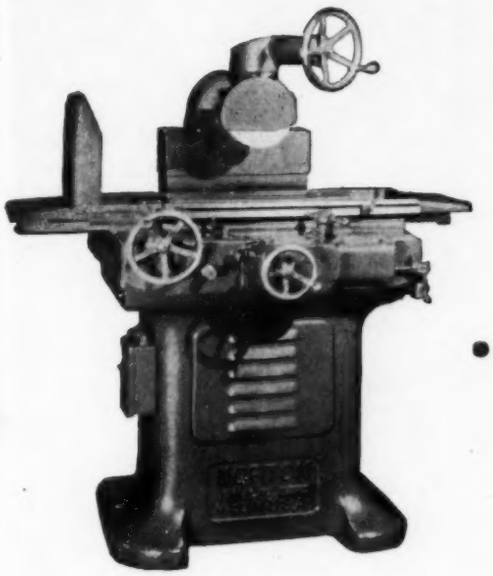


Flodar's Grip Tube Fitting Prevents Hydraulic Leakage

The Grip Tube fitting, employing a hardened alloy spring-steel sleeve, is introduced by Flodar Corp., 331 Frankfort Ave., Cleveland, Ohio. It is said that the fitting will prevent hydraulic leakage, absorb excessive vibration, and, through proper support of tube, prevent breakage at the flare.

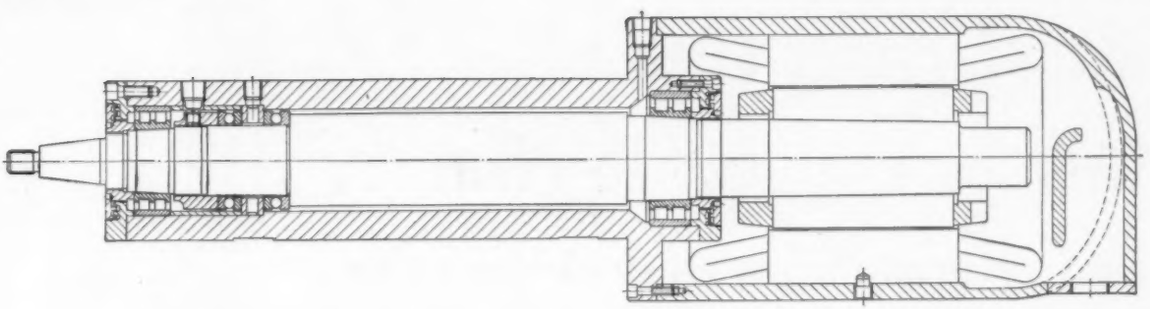
The unit consists of three parts: a connector body, a tightening nut, and a contracting sleeve. Sleeve grips tube with slotted, spring-steel fingers when the tightening nut is turned. Fittings are available in ¼- to 1½-in. sizes in straight, union, elbow, side tee, tube tee, and cross, both male and female.

for maximum rigidity and accuracy



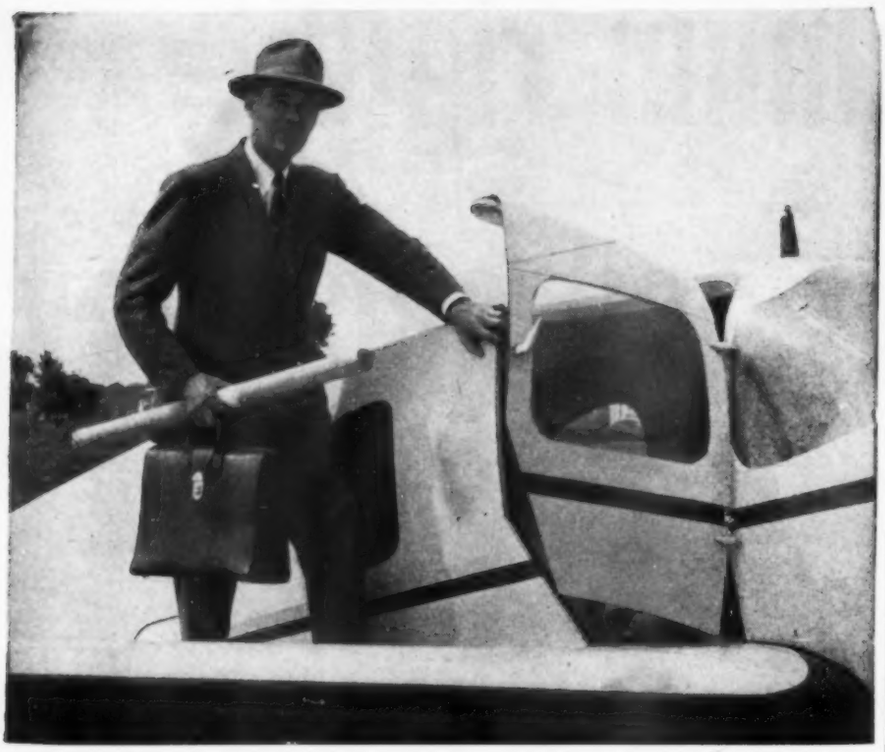
● *Motorized Surface Grinder built by Norton Co.*

● *Spindle built by Pope Mach'y Corp.*



This Norton Surface Grinder is equipped with a Pope precision, motorized spindle using the typical SKF Spindle Mounting for maximum rigidity and accuracy. SKF Double Row Cylindrical Roller Bearings assure minimum runout at the wheel while SKF Thrust Ball Bearings virtually eliminate any "camming action." The spindle is dynamically balanced on these grease-lubricated bearings to reduce vibration and provide smooth operation. For further information concerning SKF machine tool bearings, ask for our new Catalog No. 272. 6368

SKF INDUSTRIES, INC., PHILA. 32, PA.



Manufacturer Flies Ryerson Engineer to Plant...

and returns him with problem solved

A machinery manufacturer faced an emergency. He was changing over to flame-cut steel plate for many parts previously cast. In the process of changeover, unforeseen production problems threatened to stall his entire operation. Committed to a heavy schedule of deliveries he saw the threat of reduced volume as an inconvenience to customers—a mark against his company.

Moving swiftly against time, he called Ryerson in a neighboring state offering to send his company plane if a Ryerson specialist would make a flying trip to his plant. We agreed, and, in a matter of hours, a Ryerson engineer was on the spot giving practical assistance.

By simplifying several parts, engineering difficulties were avoided. Standardization of other parts reduced cost and made better use of available steel. There was no slow-down in production.

As our specialist was flown back that same day, he made out a report covering his activities. It was brief enough. It read: Customer service.

That brief report—customer service—sums up the reason so many steel users make Ryerson the first source for steel from stock and turn to us in time of trouble. Despite steel shortages there is no shortage in our willingness and ability to cooperate. Our technical men will gladly work with you on any steel problem, or assist in the search for a suitable alternate when needed steel is not available.

Remember that Ryerson facilities and experience are always at your service when you call.

JOSEPH T. RYERSON & SON, INC., Plants: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles

RYERSON STEEL

ROUND TABLE *Discussion*

MOVE MEN UP OR IN?

A great many companies today still believe that ALL men should be moved up. Many businesses operate by bringing men into the organization at a young age, generally right out of high school or college, and then advancing them up through the ranks. Sometimes after twenty to thirty years of service the employee may reach a position as a company executive of top rank.

This method of operation has some merit in that the men usually become extremely loyal to the organization, yet creeping paralysis generally sets in and the company becomes stagnant in growth.

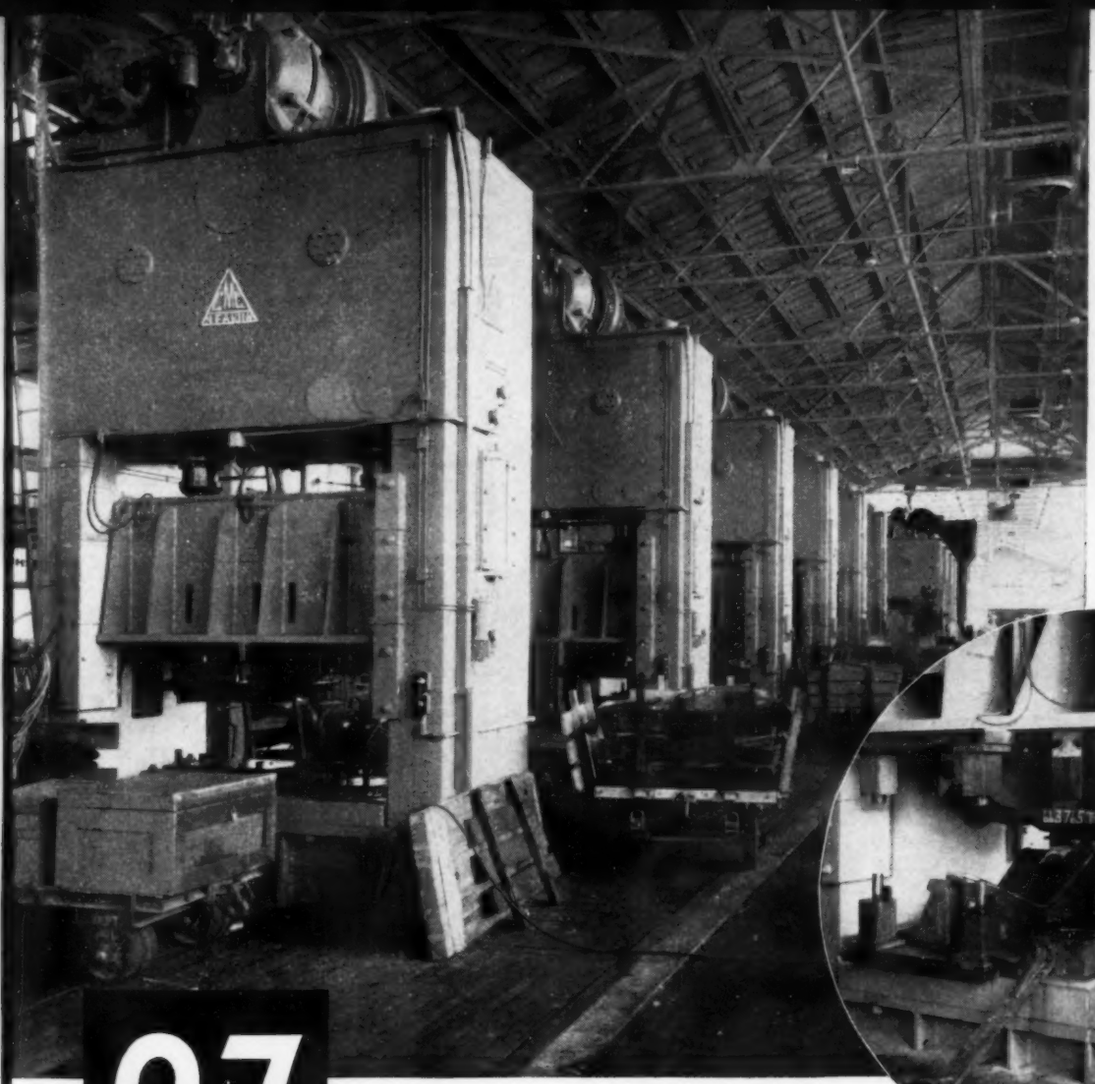
Why shouldn't a company be able to produce as economically by advancing men within the organization and never bringing in new blood as a company that occasionally brings in a specialist?

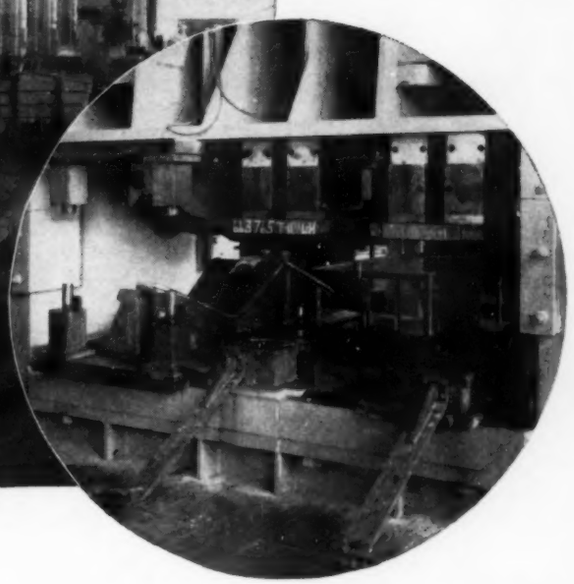
First, the young employees taken into the organization at a low wage usually have no practical experience. They must learn the trade from men who have previously done the work to which they are assigned. Therefore, only the tricks or shortcuts, etc., that have been developed through the years at that one company by one group of employees are there to be passed on to the apprentices.

We are all too human to work any more than is necessary to earn our wages. This will account for the fact that new ideas that could come from study are not generally introduced into a company that moves men up from within their own organization.

Usually the companies that believe in moving men up through the ranks and never bringing men in from the outside do not believe in sending men to technical meetings or to exhibits of various types. So, again the company lives within itself.

On the other hand, no company should go to the extreme of always going outside for new talent. The employee takes the attitude that he is being milked dry of ideas and left to die on the vine. We have some companies that do operate this way. They are usually, however, the large corporations that can survive for a period of time, regardless of the attitude of their personnel. Sooner or





Inset: Clearing's four-point suspension assures accurate alignment despite extreme unbalance of work load.

27 CLEARING PRESSES AT WILLYS-OVERLAND

New, Up-To-The-Minute Stamping Facilities Give "Jeep" Maker Maximum Production Speed and Economy

As an important part of their new set-up to fulfill demands for the popular "Jeep" vehicles, Willys-Overland recently installed 27 new Clearing presses to handle the body work on a broad line of automobiles, station wagons and trucks. It is estimated that the new stamping plant can process 8,500 tons of steel per month.

Since low weight is a particular Willys feature, this clearly represents mass production of a high order—and that is Clearing's specialty. For Clearing presses are designed and built to turn out parts at minimum cost. No expense is spared in Clearing presses if a one-time expenditure can reduce the repeated costs of volume production. That's why Clearing presses are the economical buy for the plant that means business.

If you are now planning tomorrow's production for mass output in a competitive field, it will pay you to contact Clearing.

CLEARING MACHINE CORPORATION • 6499 W. 65th St., Chicago 38, Ill.

CLEARING

THE WAY TO EFFICIENT MASS PRODUCTION

YESTERDAY'S PIONEER • • • TODAY'S LEADER

HERE'S A SINGLE ORDER—
48 Large Special
WELDON End Mills

The 48—*Count 'Em!*—48 special large WELDON end mills above represent a single order recently shipped to one of our enthusiastic customers. These are special husky, fast metal-removing WELDON end mills built for sturdy dependable service.

This customer orders in lots like this because he realizes that his profits depend in part on the use of WELDON end mills, noted for their quality, accuracy and fast-cutting performance.

Write for Catalog 8-B

THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

later, however, the corporation will feel the effects of this through the disinterested attitude of the manufacturing divisions and sales personnel. This will result in an inferior product and lower product sales.

A company should follow the rule of moving men up and also moving men in. This brings in new ideas, lower production costs, and keeps the company alive.

A progressive company will have a program of employee education, stress the reading of technical magazines, the attendance at meetings of various technical societies, and the attendance at various shows and expositions where new equipment, processes, and tools are being shown.

A company which moves men both up and is progressive will be able to meet competition.

Charles D. Townsend
Centralia, Mo.

•

ARE TOOLMAKERS OBSOLESCENT?

If all toolmaking operations could be definitely specified, separately finished, and effectively checked for dimension and finish, the answer could be a decided yes.

During the last 50 years, much advantage has been taken of the value of specialization and many toolrooms are tool-production shops. Turning, slotting, milling, are done by the appropriate men, successfully and more expeditiously than under the old custom. No longer are valuable tool-production machines earmarked and allowed to stand idle, waiting for the grave, bearded expert, who, with becoming dignity, spreads himself out to do everything on anything. As a consequence, all the machines in a plant can be more continuously used; they become more productive and, for a number of reasons, their production is reduced in cost. Each machine man will be more expert on his own job and on a machine frequently used.

At the same time, the need for really efficient toolmakers is as real as ever. This is particularly so where the individual skill of the craftsman is needed, as for example, with press tools. In some shops, when the definite, measurable operations have been done, the "toolmaker" is given the task of finishing the tool. He must not only insure that it is to drawing, but also that it will function satisfactorily and produce parts that are in accordance with production drawings. In doing this, he will be faced with possible slight differences in material size and its draw-

Imagine a store with gifts like these...

aluminum luggage that gives strength and beauty... aluminum appliances that can't rust or corrode... aluminum furniture that moves with a touch

aluminum toys that are light but rugged... aluminum sports equipment that lasts for years

More and better aluminum products—*today*...with

Kaiser Aluminum

a Permanente Metals product

ACTUALLY, a large department store could be opened today which features *nothing but* aluminum products.

For all the products pictured above — plus hundreds more — are being made right now, offering more *comfort*, more *convenience*, more *beauty*.

Recognizing this, millions of people are *demanding* aluminum-made products, whether it be for building materials, household appliances, house trailers, garden tools, or what have you.

You, too, can demand—and *get*—these products. They're now being made in ever greater quantity because Permanente Metals, led by Henry J. Kaiser, is rushing to manufacturers the light, bright, lasting metal that makes them possible.

In but a single year of operation, Permanente Metals' huge processing plants produced 175 million pounds of plate, sheet, and strip aluminum. Almost as much as the entire industry produced in the most productive year before the war!

That's why there are more and better aluminum products . . . today . . . with Kaiser Aluminum!

Get the Manufacturers' names

For the names of manufacturers nearest you who make the aluminum products pictured above, write:

Permanente Products Company

Consumer Service Division, 1924 Broadway, Oakland 12, California

More than 600 products are now being made of Kaiser Aluminum.

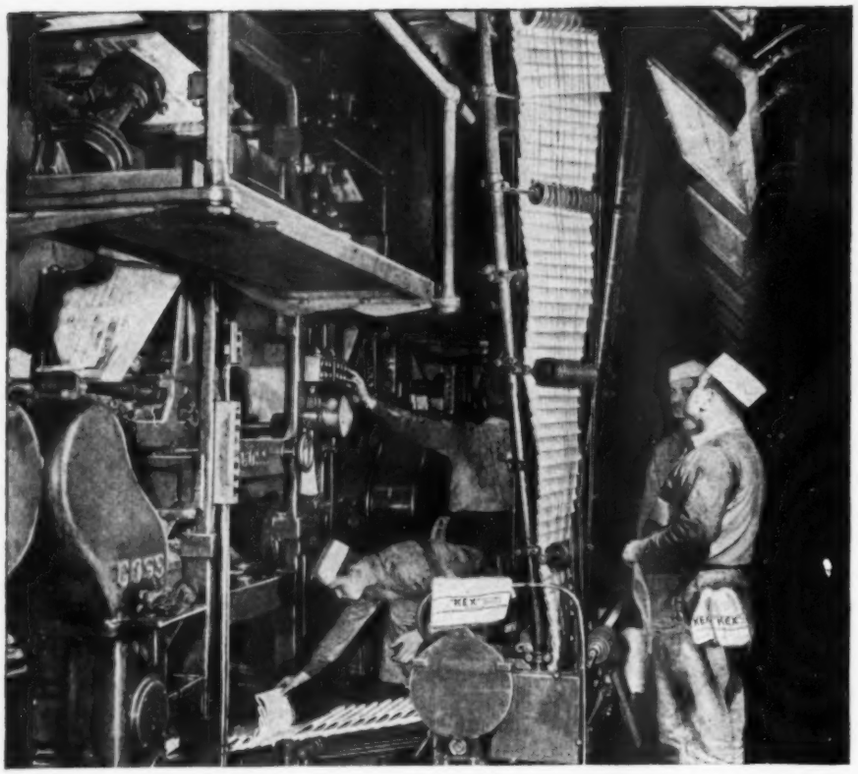
More than 1,000 manufacturers are using it.

Yet Kaiser Aluminum has been on the market for only 1½ years!

For a sample of the kind of action that brought us so far so fast, call any Permanente Products' office . . . and put us to work for *you!*

KAISER ALUMINUM IS SOLD BY PERMANENTE PRODUCTS COMPANY, KAISER BUILDING, OAKLAND, 12, CALIFORNIA—WITH OFFICES IN:
Seattle • Oakland • Los Angeles • Dallas • Wichita • Kansas City • St. Louis • Atlanta • Minneapolis • Milwaukee • Chicago • Cincinnati • Cleveland
Detroit • Boston • Buffalo • New York City • Philadelphia • Washington, D. C.

"KEX" Industrial Wiping TOWELS



...More Important Every Day to the *AMERICAN INDUSTRIAL SCENE*

[Here—the Press Room, Chicago Sun and Times]

This important newspaper, as well as many other leading papers have found KEX Industrial Wiping Towels "made to order" for important wiping needs.

The reason—KEX Industrial Wiping Towels are produced especially for wiping. They are soft, with no harsh seams, no hidden buttons to mar delicate surfaces.

Every wiping towel is thoroughly cleaned and inspected before delivery to you. They come in neat, easily stored bundles that help you control distribution.

Follow the lead of industrial leaders who overlook no opportunity to keep operating costs down—and efficiency up.

Nothing to Buy—No Expensive Inventory—Just a Low Monthly Rental. The first month should show a decided saving on wiping costs.

For complete information, see your classified Telephone Directory for nearest KEX distributor, or write KEX NATIONAL SERVICE, 295 Fifth Avenue, New York 16, N. Y.

"KEX" NATIONAL SERVICE

REG. U.S. PAT. OFF.

ing qualities, and to produce correct components he may have to depart slightly from tool drawing.

Toolmaking skill of the highest class is needed. This cannot be uniform in quality and cannot be transferred from one to another. Therefore, on work where the personal skill of the craftsman predominates, the toolmaker is not obsolescent—yet, can he ever be obsolete is a query, or isn't it?

J. E. Powell
Glos., England

•

EXCUSES OR EXCELLENCE?

Ed's hollering from the pricking of the "quality" needle is just the old "transition" blues. To every shop foreman its appearance is cyclical—the early years of a war, or the advent of a boom "injection" from a merger, where the keynote is quantity high, wide and discordant.

With the pressure on for more and more, leaks appear and quality sense gets stretched thinner and thinner. The designer becomes a high strung, quick tempered prima donna, who begins to lose the broad-minded amenability to change and suggestion, which helped make him a success in his job. Decisions must be made, and, right or wrong, there's time only for an unequivocal yes or no.

As the new contract progresses down through the shop, so goes this infection. Probably the last to feel it is inspection. Bound and governed for years by "if it meets spec, it's quality—if it doesn't, it isn't," the rejections grow and the borderline between scrap and salvage broadens.

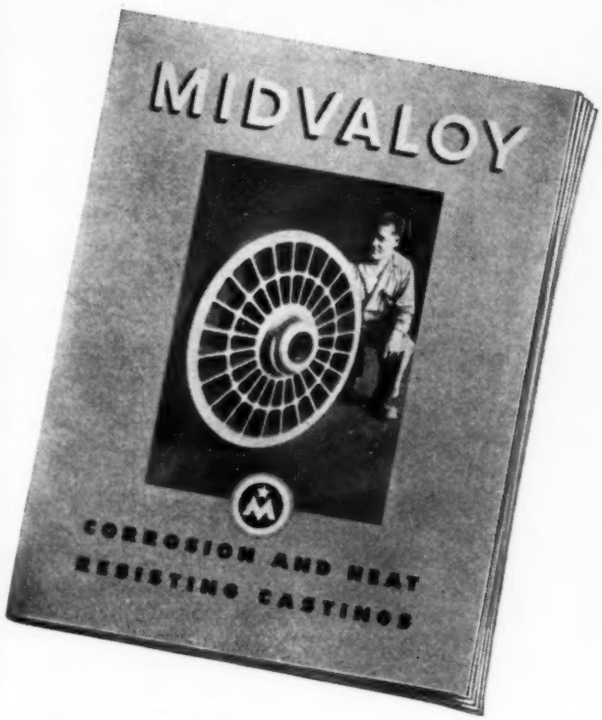
Before anyone realizes it, the salvage committee, which has grown to the largest in the shop, is opening up tolerances right, left and center to get something, anything through to the assembly floor. Naturally it isn't long before foremen, group leaders, setup men, and even operators, are granting their own deviations. A permissible exception yesterday becomes the accepted rule today, and as time and quantities go by, the rigid specifications become but a memory to the oldsters and unheard of to the new. Inevitably comes field-service kickbacks and/or the period necessitating all this, ends, as did the war.

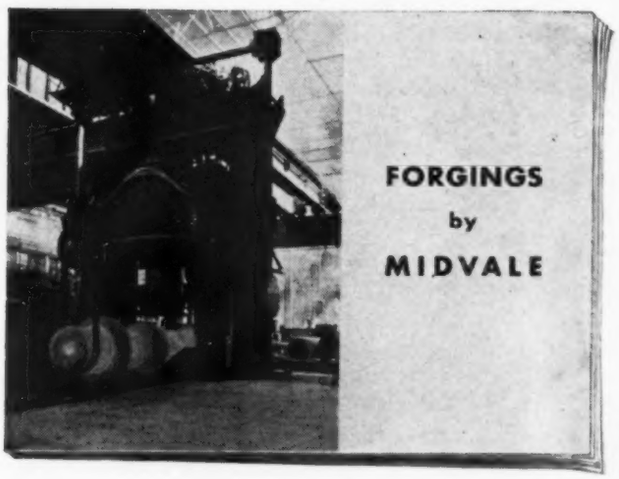
Gathering up the slack is, shopwise, a peculiar operation, in which the only tangible evidence of the recent shambles is the locked door on the now abandoned salvage crib.

Also, when the "budget" rears its ugly head and clips off short all

ALL ABOUT FORGINGS, STAINLESS CASTINGS, TOOL STEELS

Midvale's three new descriptive catalogs on Forgings, Stainless Castings and Tool Steels are required reading for 1948. The best way to start the New Year—ask for copies of the catalogs which will interest you. They are new, complete, full of up-to-date information on *custom steels.*





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CORROSION AND HEAT RESISTING CASTINGS

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It's no trick at all to gage inside dimensions of finished holes, slots, and keyways when you use the Lufkin Telescoping Gage. The handle is easily centered on the plungers, which telescope under constant spring tension, to provide the delicate balance and feel so essential to accuracy. A twist of the handle locks the plungers in position for measurement with micrometer. Available in six sizes, with 5/16" to 6" range. Write for free catalog. THE LUFKIN RULE CO., SAGINAW, MICHIGAN, New York City.

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LUFKIN FOR ACCURACY

hope of complete overhaul or replacement of worn-out or obsolete equipment, this makes "excuses" instead of "excellence" but a small wonder.

A. M. Elliott
LeRoy, N. Y.

•

RATING OR RATTING?

To have a high rating the individual must have an agreeable contact with Tom, Dick, and Harry, however much their dispositions differ.

However high a foreman may stand technically, he must have a manner of approach and clarity of expression to meet with success in his many contacts.

I think the rating plan, as outlined, is a good one. It gives a man his estimated value and offers him an opportunity to improve his standing when his weak points, which he himself had not before realized, are pointed out.

John Mark May
Watervliet, N. Y.

•

"What is sauce for the goose is sauce for the gander" may aptly be applied to the objections of a supervisory employee to merit rating, when he himself is the object of such rating. Rating hourly employees is now an accepted industrial practice in determining and evaluating the qualifications and progress of such workers. Rating supervisors should also be in the same category. A supervisor is also an employee of the company and his progress is just as vital as that of the hourly employee to the welfare of the company.

To facilitate and improve the work of each department, to insure justice being done in matters of promotions and salary increases, to secure for each employee placement at work for which he is best suited and at which he has the greatest opportunity for improvement, some records are necessary and some system of maintaining contact with employees and obtaining data regarding their performance is required.

When reasonable progress is not indicated, investigation should be made to determine reasons for poor showing, and, if possible, to remove them. A conference between the supervisor and department head is a logical step to iron out any impediments to improved operation.

The merit-rating or progress-report system applied to the supervisor enables him to check on his

NOW! Easy to order STANDARDS

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THIS new Carboloy Cemented Carbide Catalog lists *over 600 standard low-cost blanks, tools, wear parts and specialties!*

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- Over 180 standard tool blanks—
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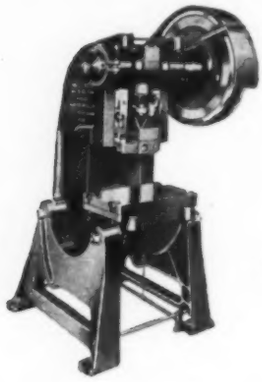

SHAPE-RITE SHAPERS

New and improved Press-Rite Presses, and Shape-Rite Shapers are now ready to meet the exacting demands of present day "stepped up" production. Press-Rite Presses, and Shape-Rite Shapers have been tested and approved after many years of service in large and small manufacturing plants, tool and die shops, small instrument manufacturers, etc. Press-Rite Presses are built in several sizes, all open back inclinable models from 5 to 30 ton capacity. The Shape-Rite Shaper is built in one special Hy-Duty model with 8 inch stroke.

We solicit your inquiries and will forward complete information upon request. Write to Dept. A-145 or see your local dealer.

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own development and progress as a supervisor and gives him an opportunity to discuss his progress with the department head.

An advantage of the rating form for supervisors, which should overcome any objections from supervisors to have themselves rated, is that it is a visible and tangible form of the rater's evaluation of the supervisor's job, and is not hidden in the recesses of the management's mind. The supervisor after being rated may ascertain his relative standing with other supervisors in the organization, and if the department head should be transferred or leave, the merit form will always be available on file for the information and guidance of the new department head.

Improved operation will result due to the fact that the best man will get the better job for which his rating form indicated his eligibility and choice.

Rating forms do much to minimize unjust discrimination, which is often a factor in filing supervisory positions. If the data is in the records, promotions are made on a sounder and more equitable basis.

Harry Kaufman
Phila., Pa.

The employee-rating form is looked upon with suspicion by all who have not had a thorough explanation of its workings and benefits.

Al sums up the essence of the whole merit-rating system when he says that he likes to know how he is doing in his work, and welcomes the opportunity to discuss his job progress with his boss. It is this personal interview which gives a man an opportunity both to defend himself, if he feels the rating is not fair and before it becomes a part of his permanent record, and an opportunity to improve on those qualities which need building up. Everyone has some particular trait that stands out more than the rest. Some have keener minds, some better personalities, while still others have more drive and initiative.

We all feel like Al—we don't like criticism, but if it is given by those we consider the "right people" and in proper spirit, we usually profit.

There may be some faults about the system, as it is now set up, but as time goes on, and it is used to a greater extent, many of these faults will be corrected. Management is well aware of the fact that in the past many irregularities took place,

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For best results, get in touch with Sewall engineers while your product is still on the drawing board. Close tolerances are efficiently maintained in the production of racks... sprockets... spur... spiral... bevel... Zerol bevel... worm gears. We furnish prompt estimates on any quantity.

E. B. SEWALL MANUFACTURING CO.
696 Glendale St. St. Paul 4, Minnesota.

One of a series *of messages to help you increase your understanding of business paper advertising, and its effect on your business.*

Why you and your advertising manager are partners

FROM WHERE YOU SIT, advertising may look like the "glamour department" of your company—necessary, of course, but pretty far removed from the hard-headed realities of the production line.

But take a closer look. In one respect, the advertising manager's job bears a striking resemblance to your own.

You're production-minded. You're concerned with anything that will improve plant procedures, speed up assembly time, prevent waste, and reduce the manufacturing cost per unit.

And that is precisely where you walk arm-in-arm with your advertising manager. Because he thinks the same way about the *manufacture of a sale.*

The whole process of selling and distribution are his assembly line. And every time he can reduce the unit cost of a sale by so much as a few cents, he increases your company's chance to show a profit.

Ask him for a definition of advertising, and he will probably tell you that it is simply *mechanized selling,* a machine that multiplies the productive capacity of the sales force — seeking out prospects, arousing their interest, creating a preference for the things your company makes.

And when it is concentrated among the hand-picked readers of business papers, advertising becomes the most efficient machine this partner of yours has found for lowering the cost of producing a sale.

What are the ten ways to measure the results of your business paper advertising? You'll find the answers in a recent ABP folder, which we'll be glad to send you on request. Also, if you'd like reprints of this advertisement (or the entire series) to show to others in your organization, you may have them for the asking.

American Machinist

is one of the 129 members of The Associated Business Papers, whose chief purpose is to maintain the highest standards of editorial helpfulness—for the benefit of reader and advertiser alike.

How to Save Hundreds of Hours Controlling Production and Costs

Sunbeam Corporation, Chicago, simplified control of production, costs and payroll through McCaskey "Visible-Filing and One-Writing" in 1921; has extended control several times with increase in facilities for manufacturing the "Shavemaster" and other Sunbeam electrical products.

McCaskey provides their central production office with visible control over all the work in process by piece part numbers and operations with a minimum of clerical overhead, according to Mr. John J. Kaser, Sunbeam Production Manager. Thousands of posting operations are saved, for example, by quickly filing copies of control tickets on McCaskey Planning Boards for this control.

The visualized tickets provide a progress record by operations (frequently as many as forty) that is available at a glance, as shown in the illustration above. They also constitute a complete record of work-in-process that is both accurate and up-to-date. Errors and delays seldom occur since the tickets are identical copies of certified original records.

Additional copies, made without additional writing, promptly provide the Payroll Department with data for computing incentive and non-productive earnings, the Cost Department with identical information for analyzing actual performance in comparison with standards, and Employees with a "receipt for pieces made" and a later verified record of earnings.

This one multi-copy ticket thus provides the data for complete production records and control and makes them available with a saving of thousands of hours of clerical work annually. Continued use of the McCaskey fundamentals of "One-Writing and Visible-Filing" for twenty-six years indicates the flexibility of McCaskey Controls and their adaptability to rapidly expanding and changing requirements.

Write for a demonstration and suggestions for an application to your particular needs—or send for a copy of "The ABC's of Production Control" and other descriptive folders.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

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often resulting in an unqualified man obtaining a promotion over a better man. The employee rating form is no guarantee that these abuses will be entirely eliminated, but since these rating forms are often studied by other people, the boss will be more careful and more accurate in his rating in order to preclude the necessity of answering some embarrassing questions.

Robert Knotek
University Heights, Ohio

NEW BOOKS

MAGNETIC CONTROL OF INDUSTRIAL MOTORS—*By Gerhart W. Heuman, Control Engineering Division, General Electric Company. Published by John Wiley & Sons, Inc., New York. 589 pages. Price $7.50.*

Industrial electrical control can be treated in two ways. One is the design aspect, covering the principles and specific details of control devices. The other, which is the subject of this book, is application.

Application engineering is liaison to a high degree. Intelligent selection of control equipment must be based on thorough knowledge of the machinery being driven, and all its peculiarities, and upon the behavior and characteristics of the motor or motors which are to power the machinery.

In another sense application engineering is the design of a complete controller, "tailored" for a certain job, while control design is the design for manufacture of the separate control devices and elements.

This book discusses practical operating principles of all well-known motors, ac. and dc., the function of widely used control devices of all types (except electronic speed control), and explains typical complete circuits and controllers for various uses.

•

YEARBOOK OF THE AMERICAN IRON & STEEL INSTSTUTE, *350 Fifth Ave., New York, N. Y. 718 pages. Price $3.50 to non-members.*

This yearbook covers the 55th general meeting of American Iron & Steel Institute on May 21-22, 1947. Besides reporting the general program, the yearbook includes 24 technical papers that were presented by

NEW!

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14" Drill Press

South Bend presents this new 14" Drill Press as a companion to the South Bend Precision Lathe. It is built with the same high standards of accuracy and skilled workmanship. Years of painstaking research and experimentation have gone into its design. This has resulted in a superior tool unsurpassed for accuracy, ease of operation, versatility and dependable performance.

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Quick-acting belt tension release lever simplifies speed changes. Keeps tension correct.

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Provides shielded illumination for work area. Separate on-off switch.

SPINDLE
Free-floating design prevents misalignment, side thrust, and whip. Travel of spindle . . . . . 4"

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Sealed, precision type. No oiling. 2 on spindle drive unit, 2 on spindle.

QUILL BEARING ADJUSTMENT
Compensates for wear.

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Graduated in inches. Adjustable collars control feed and return.

RUGGEDLY CONSTRUCTED
Precision-built for industrial and all other types of shops.

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Drills to center of 14" circle.

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Capacity . . . . . 0 to ⅝"

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Four — 707 to 4322 r. p. m.

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Bench Model . . . . 17"
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10" x 10" . . . . Tilt Type

COLUMN
2¾" diameter. Accurately ground.

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Floor Model . . . 235 lbs.

MOTOR REQUIRED
½ h.p., 1725 r.p.m.
Vertical mounting. On-off switch provided.

$98.00 f. o. b. factory, bench model with chuck, extension cord and switch; less motor.
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various authorities. As is natural under the circumstances, most of the papers dealt with problems of specific interest to the steel industry, but there were several subjects of importance to men in fabricating work. Among these were:

"Shaping and Forming," by Willibald Trinks, wherein this eminent authority on plastic deformation discusses certain matters which had often been overlooked in respect to forging and piercing.

"Problems Involved in Fabricating High-Temperature Alloys," by Gunther Mohling, discusses the forging of gas-turbine buckets.

In "An Appraisal of Hardenability and Specifications for Alloy Steel," D. H. Ruhnke discussed the H-steels, and particularly the revisions in hardenability bands made possible through increased use of the 8620, 8640 and 8645 steels by the automotive industry.

Steady increase in consumption of sheet strip and tinplate for 40 years has required development of many grades and finishes. An important paped by Reid L. Kenyon, entitled "Finishing Steel for Decorative and Protective Purposes" shows what some of the major developments have been in ferrous materials in order to receive the five main types of surface treatment: (1) paint and lacquer, (2) metallic coatings, (3) combination of metallic coatings with non-metallic coatings, (4) porcelain enamel, and (5) special finishes on stainless steel.

•

MECHANICS—*By John C. Slater and Nathaniel H. Frank, Professors of Physics, Massachusetts Institute of Technology. Published by McGraw-Hill Book Company, 330 W. 42 St., New York 18, N. Y. 297 pages. Price $4.*

Introduction to Theoretical Physics, published in 1933 by the same authors, is now being rewritten in several volumes, of which this book is the first. Particle dynamics and problems of oscillations, involving ordinary differential equations and simple vector analysis, come first. Then follow vibrations and wave motion, introducing partial-differential equations which can be solved by separation of variables, and Fourier series. Elasticity and hydrodynamics bring in more general partial-differential equations, potential theory and differential vector and tensor operations. In this way the mathematical foundation is built up on which most of the rest of mathematical physics is based.

Appendices give mathematical background in sufficient detail for the student familiar with the calculus. Historical order is about the same as the order of increasing mathematical difficulty, for each branch of physics as it develops builds on what has gone before.

Theoretical physics, the subject of this book, should be considered as a collection of methods, tools and processes rather than a lot of mysterious formulas, and the aim of the book is not to teach a mass of facts, but to teach mastery of the tools by which facts have been discovered, and will be discovered in the future.

•

POWDER METALLURGY, ITS PHYSICS AND PRODUCTION—*By Dr. Paul Schwarzkopf, in collaboration with George Stern and Drs. C. C. Goetzel, Robert Steinitz and Warner Leszynski. Published by the Macmillan Company, 60 Fifth Ave., New York, N. Y. 379 pages, 6 x 9¼ in. 90 tables, 164 illustrations. Price $8.*

Dr. Schwarzkopf, inventor of the multi-carbide hard metals, presents here what he calls his "notebook" of powder metallurgy, without usual commercial reservations on restrictions. He thus more closely approaches "telling all" than do most.

The book (which is excellently printed, by the way), is divided into four main sections: processing, products, theoretical principles, and future developments. Each is broken into appropriate chapters and contains its own extensive bibliography. The first section treats processing quite thoroughly; the second is broken into chapters on dense materials, porous products, refractory metals, hard metals, electric contact materials, magnetic materials, and friction parts.

All in all, the volume is a useful handbook for anyone interested in powder metallurgy.

•

APPROVED EQUIPMENT FROM INDUSTRIAL FIRE PROTECTION—*Published by Associated Factory Mutual Fire Insurance Companies, Inspection Dept., 184 High St., Boston 10, Mass. 135 pages. Price $2.00.*

The 1947 edition lists the names of manufacturers and the specific devices which have been approved by the Factory Mutual Laboratories. It also contains typical illustrations and advice on use of the equipment.

The arrangement is by classifications with indexes covering both the devices and firm names.

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Time saver—

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Foundry and metal-fabricating shop operators are overwhelmed with their increased piece work production from BAYFLEX RAISED HUB DISC WHEELS.

Yes, where heavy duty portable grinders and sanders are used the jobs can now be done much faster—easier—cleaner. No wonder that BAYFLEX is so popular with management and operators alike!

The merits of this new product are many . . . the production possibilities unlimited. To appreciate the full value of BAYFLEX however, you must see it in operation. Ask for a demonstration at your plant. No obligation.

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Hundreds of uses in auto repair shops.

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graphically demonstrate the construction and use of all basic tooling equipment, in the new book:

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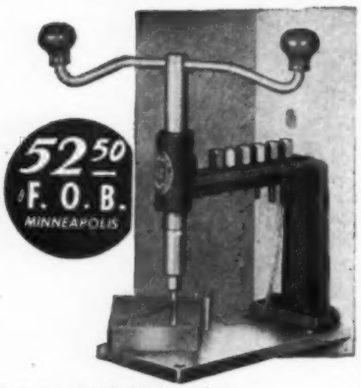
Reduce COSTLY TAP BREAKAGE



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Die makers can be tied up for hours trying to dislodge broken taps caused by hand tapping. Now the Dahlstrom Tap Guide does the job in a fraction of the time with work always straight and true. Just fasten it to a post or bench, slip a Tap Adaptor into the spindle, and the most inexperienced operator can handle it. Equipped with 7 Adaptors, ranging from 8-32 to ½" (takes care of 95% of all tapping requirements). 12" x 6" x 14" high. (Taps not furnished.) $52.50 F.O.B. Minneapolis.

Literature on request

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Dahlstrom TAP GUIDE

The Process Engineer's Place in Industry

By JAMES JONES
Master Mechanic
Hudson Motor Car Co., Detroit

WHEN a new job is planned, the work of the process engineer begins; it ends only when the product is successfully produced by the method he has outlined. Hence, before any product design is frozen, the process engineer should be given an opportunity to study the design and recommend any changes for better manufacturing purposes. Changes may include the actual material used, even the method of producing it. Weldments may be proposed to replace castings, or vice versa; upset forgings to combine shafts and flanges; impact extrusions to replace costly machined parts; and many other items in which the process engineer's know-how can frequently effect substantial savings.

When a die shop is busy, the foreman may choose to make a set of simple dies rather than a progressive die, although the latter would produce the part more economically. On the other hand, the die man may be very ingenious and produce a costly die for making a few parts, which is equally uneconomic. Here again the process engineer is required to evaluate the proper design.

The process engineer begins his analysis when he has been advised as to the total number of pieces required, production per hour, facilities available, and the money that can be spent on the project. Various methods for production are compared for tool and labor costs, and a survey is made of existing equipment and recommendations for additional machines. Frequently he must sell management that the larger investment involved in the purchase of new machines will pay for itself. For this job his best friend is the sales engineer of the manufacturer whose equipment is needed. Unfortunately, these two men do not always know each other's problems too well, and it frequently happens that a sales engineer will state "Here is a new item or machine which you should be able to use," but when asked "Where?", he is nonplussed.

Constant striving to improve methods already in use is another important job for the process engineer. Sometimes he finds it hard to admit that his original method can be improved, but he must keep an open mind, ready at all times to restudy his own work and listen to suggestions. No one knows the job better than the man who is doing it, and in many cases the operator may have ideas that should not be overlooked. Many important improvements and savings are obtained in this way.

After a preliminary survey of the processes involved, the serious job begins with the formal and detailed analysis. First, is the sequence of operations. Next, the locating points must be established in such a way that they can be used throughout the required processing. How much material to allow for finishing of rough parts is probably one of the most difficult decisions to be made. Too much will increase the cost and too little will not allow a cleanup.

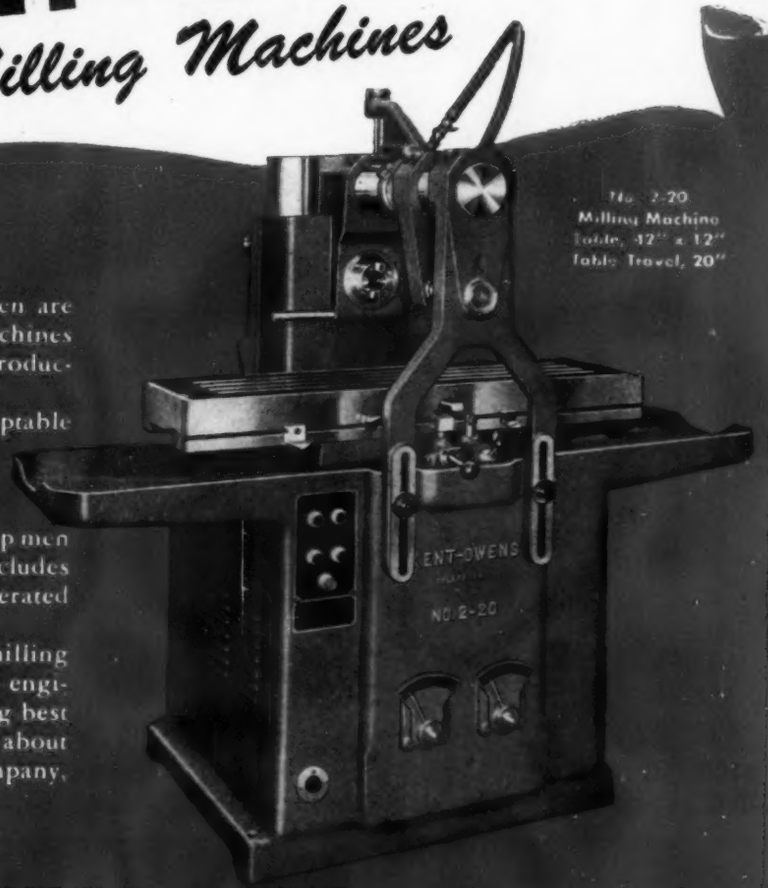
Accuracy of dimensions is another problem. This is dependent on the accuracy of location throughout the sequence of operations. It is sometimes convenient to provide ma-machined locating surfaces where the end purpose of the part does not require machining, and it is the process engineer's job to see that these are incorporated in the original product drawings. Provision for driving lugs and balancing bosses is also a part of his job if a sound tooling setup is to be obtained.

Quantity involved is a prime consideration when analyzing new production methods, but attention must also be given to whether the methods will allow maintenance of the required tolerances with a minimum of operator skill. For close tolerances, shaving methods are sometimes used, but it has been found that these are seldom successful where the material thickness is over ⅛ in.

Screw-machine setup time is usually considered a part of direct labor cost, hence an economic lot quantity must be decided upon. From this it can be decided whether a hand screw, single-spindle automatic, or multi-spindle automatic machine is most economical to use. Economic lot quantities involve setup time, labor and material costs, and the storage and inventory costs involved when a rate of production is obtained faster than is needed for assembly schedules. Generally, lots of less than 500 pieces can be run most profitably on hand screw machines, anything over 2000 or multi-

"KO" HIGH COSTS IN MILLING

with KENT-OWENS *Milling Machines*

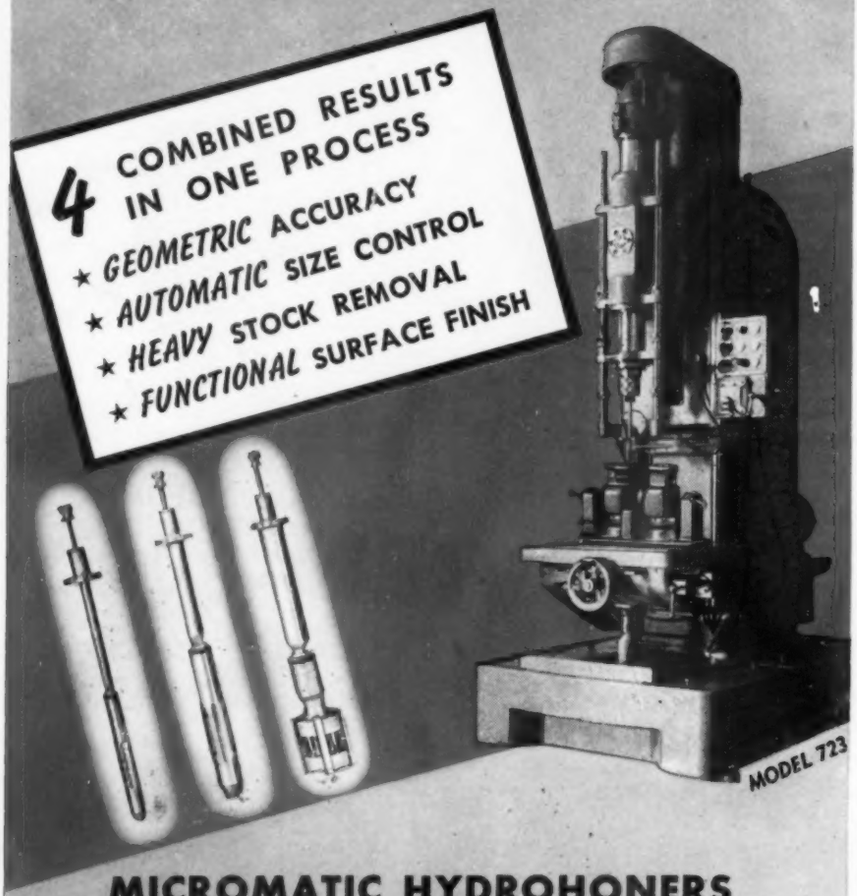


Today more than ever—production men are depending on Kent-Owens Milling Machines for the *speed* and *accuracy* that keeps production UP and costs down!

These machines are versatile—adaptable to countless milling jobs. They're outstandingly rugged . . . efficient . . . dependable. Designed for easy handling with practical features that shop men like. The Kent-Owens Standard line includes a wide range of hydraulic and hand operated machines.

If you're "floored" by a tough milling problem—call on Kent-Owens! Let our engineers recommend machines and tooling best suited to your requirements. Write us about your needs. Kent-Owens Machine Company, Toledo, Ohio.

MODERN
MICROHONING is
AUTOMATIC
PROCESSING CONTROL



MICROMATIC HYDROHONERS
equipped with Microhoning Tools

in many different installations have cut total processing by one or two operations—have reduced the over-all amount of waste stock removal—have generated uniform final size AUTOMATICALLY within 0.0001 to 0.0003-inch—eliminated selective fits in some parts—reduced inspections to one or two spot checks per shift.

The highlights of Modern Microhoning are available in sets of several booklets. Don't you want a set?

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Los Angeles, Calif. • Houston, Texas • Rockford, Ill. • Guilford, Conn. • Brantford, Ont., Can.

ple-spindle automatics. Efforts to reduce multiple-spindle setup costs have resulted in some very real advances, and at least two machine builders have eliminated the need for changing cams between setups.

Die space, shut height and tonnage required govern the selection of presses for small and medium-size stampings.

In continuous line production, the special machine and cycle times are most important. Quantities of 50,000 to 100,000 or more make it necessary to consider special machines. However, the unit type of construction offered by most machine builders, and the application of auxiliary spindle units to standard machines to convert them to special machines provides almost unlimited combinations that can be readily rearranged for model changes.

Special machines can be arranged to pace the operator and thus maintain uniform and efficient production, and the addition of automatic through-feed mechanism gives complete control of machine cycle time, which is of utmost importance in continuous line operation. By combining some operations and splitting others in the sequence, nearly uniform cycle time can be obtained with special machines.

Low production quantities, however, require a process that will keep tooling costs to a minimum. For this reason the process engineer should be consulted before a design is frozen, and given an opportunity to advise the tool designer on the type of tooling most economical for the job.

From a recent paper presented before the ASTE Detroit chapter.

How Watch Movements Are Measured

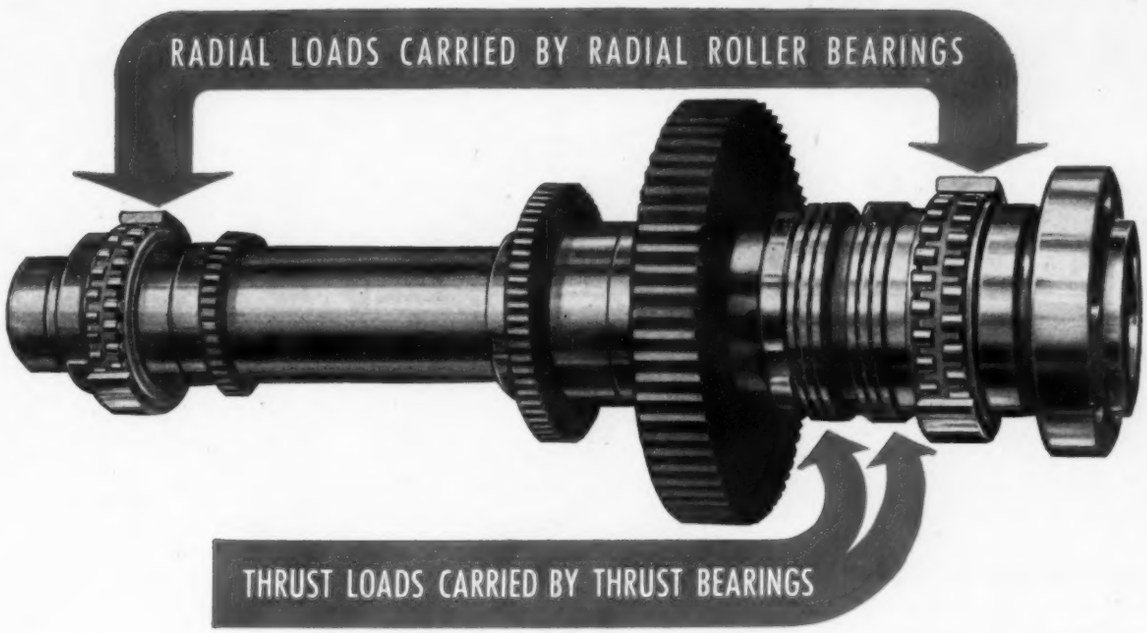
WATCH MOVEMENTS are invariably measured by the French or Swiss system, or by the American system. The French or Swiss system is based on the Paris inch, whereas the American system is based on the U.S. inch.

The Paris inch is 1/12 of a Paris foot. This inch is subdivided into 12 lignes which are used in designating the sizes of most foreign-made watches. (A ligne equals 2.26 mm. or 0.0888 American inches.)

The size of a watch is measured across the shortest portion of the pillar plate through its exact center.

For example, a 10-ligne Swiss movement is 10/12 of a Paris foot or

up to *500% Greater*
SPINDLE RIGIDITY



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Here is a spindle so rigid that its yield under load is as low as ⅛ that of other spindles.

SKF Double Row Cylindrical Roller Bearings are designed expressly for spindle use. The multitude of rollers in staggered arrangement, distributes the load through many radial contacts, providing great radial rigidity. Press fit of the outer ring in the housing eliminates yield at that point. Internal clearance is absorbed by means of the tapered bore of inner ring fitting upon tapered spindle seat.

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Radial and axial loads being sustained by separate bearings, friction is reduced to a minimum, and operating temperatures are extremely low.

This spindle is ideal for heavy-duty cutting of hard, tough steels with tungsten carbide tools. It will handle a wide range of speeds, feeds and depths of cut without bearing adjustment.

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The new model C-20 Sibley will furnish you savings on cost per piece by—

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3. Finer accuracy.

Install a new model C-20 in your plant and make a Time and Motion Study comparison with your present drilling equipment. It will demonstrate the advantages of such features as easy access to controls—where you turn a knob to select the proper geared power feed; convenient shifting of V-belt; power to drill 1½" in mild steel; 8 spindle speeds ranging from 65 to 1360 R.P.M. powered by a 2 H.P. motor.

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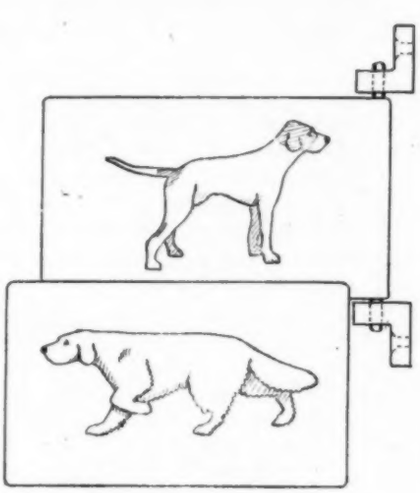
0.888 in.

American-made watches are measured by a system originated by Aaron L. Dennison*, founder of the Waltham Watch Company, in 1850. On this system, zero (0) size is the base and equal 35/30 of an American inch. Movements larger than zero are identified by full integers, such as 1, 2, 3, etc. Movements smaller than zero are identified as 2/0, 3/0, 4/0, 5/0, 6/0, etc. In each case the integer represents the number of thirtieths of an inch the movement varies from the zero size.

For example, a 12-size pocket watch movement would be 35/30 of an American inch, plus 12/30, or a total of 47/30 inch. Reduced to a "rational" fraction, this diameter would be 1 14/30 in. The well-known 6/0 size would be 35/30 in. minus 5/30, which would be exactly 30/30 or 1 in.

** This material is documented by the U.S. Dept. of Commerce in Circular 432 as well as by Report No. 20 issued by the U.S. Tariff Commission.*

Pointsetter Precision John Block Gives Close-tolerance Indication



This device, with only a single moving part, was developed during the war by Hoosier Precision Indicator Co., Johnstown, Ind., to meet a specific need in Indiana war plants and has not been previously available commercially. In contrast to the familiar "Jo" blocks, only a single indicator block is needed at a given

The stage is set . . . and here's your cue!

Coming soon: The case of the elusive customer.

Act I is, of course, to find your buyers. You already have a good idea *who* they are . . . but have you been able to reach them with a convincing *selling* display of your company's products?

The American Society of Tool Engineers is providing the stage and the audience for Act I at the Tool Engineers' Industrial Exposition in Cleveland, Ohio, next March 15-19, to help you make your contacts.

Act II is up to you!

Is your company ready for a leading role in the most important and spectacular show ever presented by ASTE? Don't forget your competitor will most likely be on the scene. Don't let him steal the show. There's still time to reserve excellent space for your exhibit.

Curtain call

ASTE's last Exposition drew thousands of top executives, industrial engineers and tool engineers . . . the very men who *dictate the purchase and can specify your product for their plants.*

New and different products and methods, technical sessions, plant tours, industrial movies, all add up to a more business-producing Tool Engineers' Exposition than ever before.

Extra Added Attraction

Coincidental with the Exposition, ASTE members will meet for their 16th Annual Convention and technical sessions in Cleveland. It's your big chance to sell the tool engineer—so make it a date for '48!

Marquee Remarks

TIME: March 15-19 • PLACE: Public Auditorium, Cleveland, Ohio • PRODUCED BY: American Society of Tool Engineers • DIRECTED BY: America's leading industrialists • STAR PERFORMERS: All Tool Engineer Industrial Exposition exhibitors • PRICE: No advance in prices • RESERVATION: Write immediately.

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For complete information write the

EXPOSITION COMMITTEE

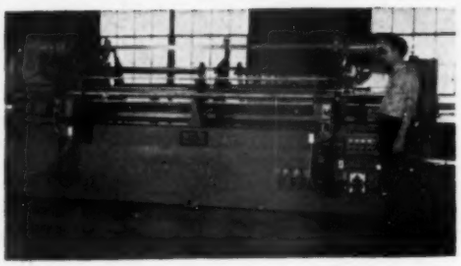
AMERICAN SOCIETY OF TOOL ENGINEERS

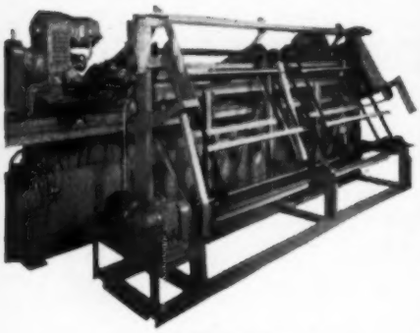
1666 PENOBSCOT BLDG.

DETROIT 26, MICHIGAN

Pines Profiler Increases Production Through Automatic Operation

This large manufacturer of metal conduit faces and chamfers 1085 pieces per hour of ½" x .076" steel conduit on a Pines Profiling machine. Previously, with hand operated equipment, the hourly production rate was only 400 pieces. The high production obtained with the Pines automatic machine has substantially reduced machining costs.





The Pines Profiler faces each end of the conduit and chamfers both inner and outer diameter to remove burrs. The work is automatically elevated to machining position, hydraulically chucked, machined on both ends simultaneously, and finally released to a discharge conveyor. This arrangement reduces rejects by eliminating bends, dents and other defects.

New Catalog . . .

Your **free** copy of the Pines circular No. 101B describing the production advantages and features of the Pines Profiler will be sent when requested on company letterhead.

Faster Chucking and Machining Reduces Costs

Simple stationary chucks and fast-acting rotating tools adapt the versatile Pines Profiler to all types of end machining work. A very versatile machine . . . it may be quickly set up to handle a wide range of diameters and machining operations — boring, turning, drilling, reaming, tapping, threading, chamfering, burring, spinning, facing and centering up to 4" diameter.

There is a Pines Profiler for your individual production requirements. Standard models include manual, semi-automatic and fully automatic types — both single and double end. Pines engineers will analyze your requirements and submit recommendations, without obligation.

675 WALNUT • AURORA, ILL.

work position, rather than a set, so cost is very much reduced. It is planned particularly for small plants with limited facilities, or for drafting rooms, toolrooms or like areas where similiar conditions are encountered and both male and female workers are employed. It can also be used in private homes, rooming houses and trailer camps. It is mounted on the center panel of washroom doors at an easily reachable level and requires no power or auxiliary units for successful operation. The entering operator merely flips the indicator so the proper face is exposed; the moving element is automatically locked in indicating position. One hasty motion sets it—which is important if the operator is in a hurry and has only one hand free. When leaving, the proper operation, to avoid misreading, is to place the indicator in neutral or on center. This shows the room, or outhouse, is unoccupied. Neutral setting is a more precise operation, but normally more time is available for it. Women or other inexperienced operators can readily be taught to use it, and need be embarrassed only once to be convinced of its worth. The bas-relief dog motifs are readily distinguishable, either by sight or feel. Called the "Hoosier" or "Who's Yere?" indicator, it prevents fatigue and indecision without noise or drawing attention either to itself or the visitor. Construction may be either pressed plastic or hand-carved wood, to match the facilities on which it is applied. It was designed and built by a well-known whittler to avoid being caught with his pants down, was called the "Pointsetter"—not after the flower, but after the breeds of dogs pictured.

TO THE EDITOR

SCRAPE OR NOT?

I would like to comment particularly on "Old Timer's" letter, *A.M.*, Aug. 28.

"Old Timer" seems to consider planning as the only alternative to scraping. If it were, scraping could be a "must" in a great many cases.

However, there are various excellent surface and slide-way grinders on the market, quite apart from the latest types at the Chicago Show, which work to as close limits as can be obtained by scraping, in a much shorter time, on a production basis, and with a mirror-smooth finish.

Heinz M. Landauer
Tampa, Fla.

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Direction of basket rotation can be quickly reversed which will change position of the load and accelerate drying. Baskets are available in shapes which experience has shown to be most effective for handling various classes of work.

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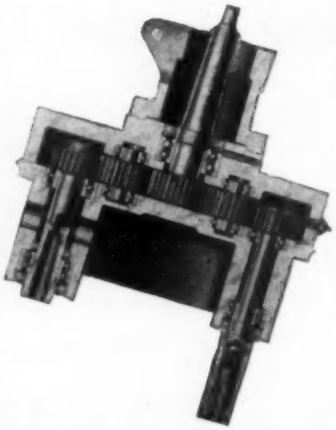
Then they began to listen. They let us prove what a soundly constructed drillhead with *hardened* gears and spindles can do. Now they specify Thriftmaster for all Multiple Drillhead requirements.



For complete engineering information, write to: Engineering Department, Thriftmaster Products Corporation, 1048 N. Plum St., Lancaster, Pa.

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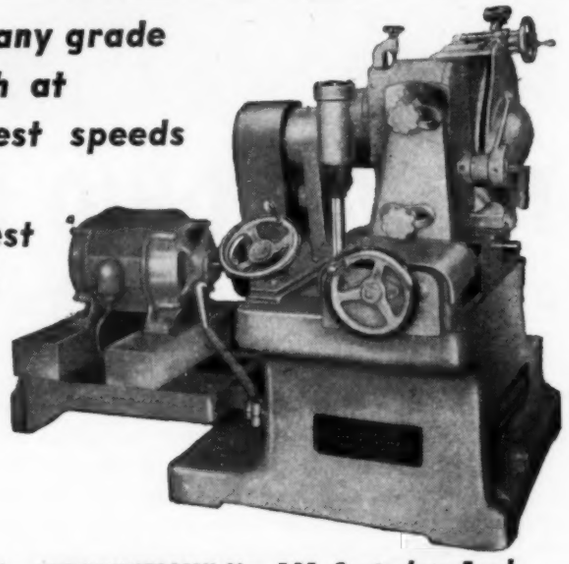

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Send for illustrated literature giving full details.

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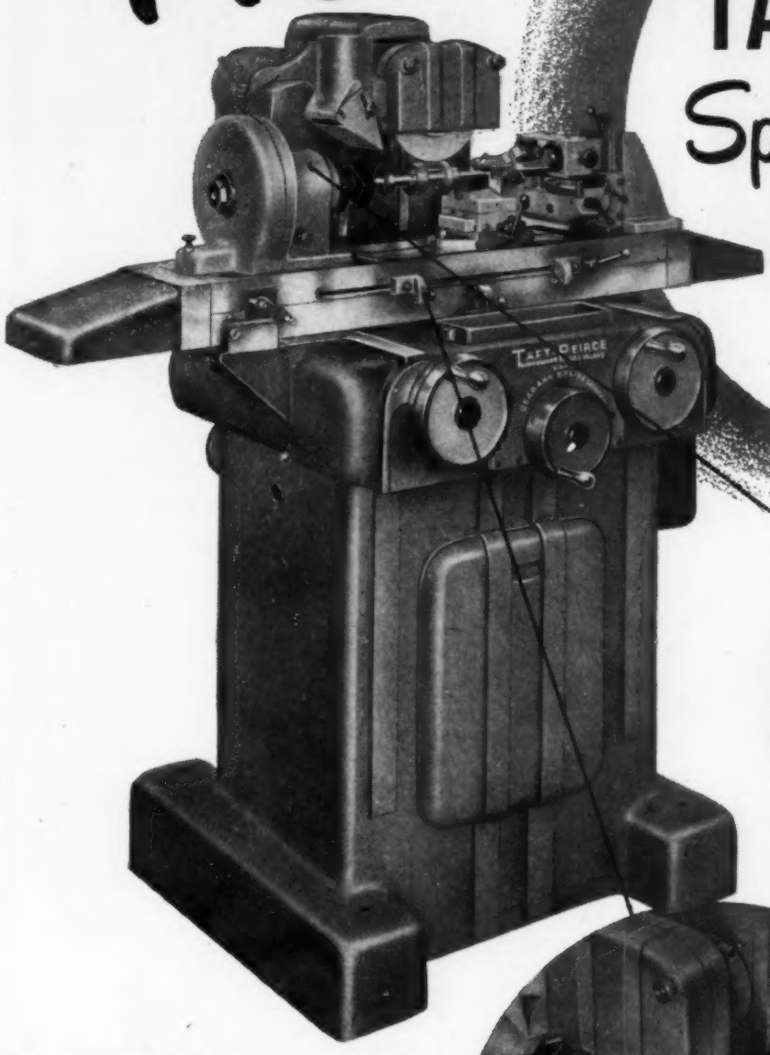
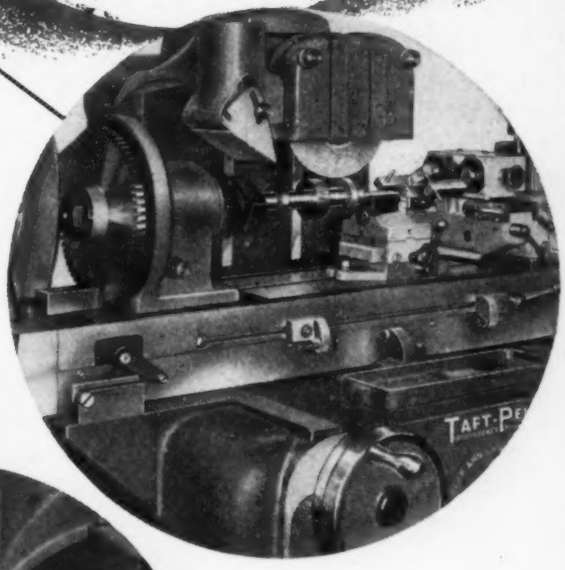
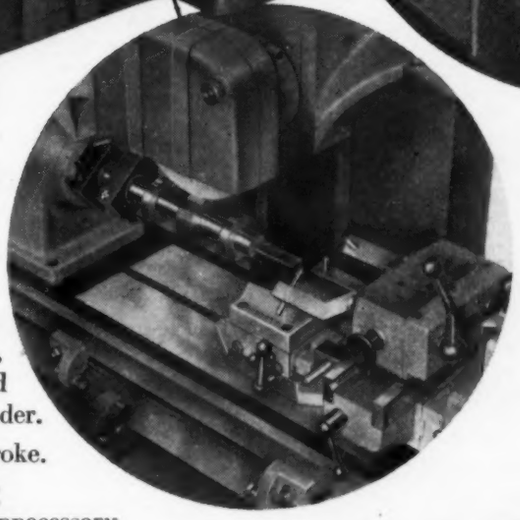
New TAFT-PEIRCE Spline and Gear GRINDER







TAFT-PEIRCE NOW ANNOUNCES a small semi-automatic grinder which produces fine-pitch gears and splines to extremely close tolerances. *Add up these features:*

RUGGED, COMPACT, EASY TO OPERATE. This machine has the same base, column, spindle-head, and bearings as the famed Taft-Peirce No. 1 Precision Surface Grinder.

AUTOMATIC INDEXING at the end of each stroke. Master plates assure precision spacing.

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QUICK ARBOR-REMOVAL by lever-operated tailstock.

WHEEL-DRESSING DURING WORK-CYCLE permitted by special 3-diamond wheel-dresser.

POSITIVE LOCKING of cross or longitudinal travel.

Write for Bulletin A6 to The Taft-Peirce Mfg. Co., Woonsocket, R. I.

▲ *Above:* Details of table, tailstock, and workhead construction, with index plate (uncovered) at left.

◀ *At Left:* Grinding a gear on the new Taft-Peirce Spline and Gear Grinder.

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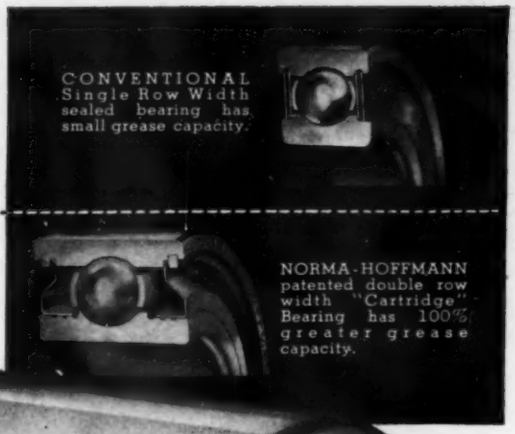

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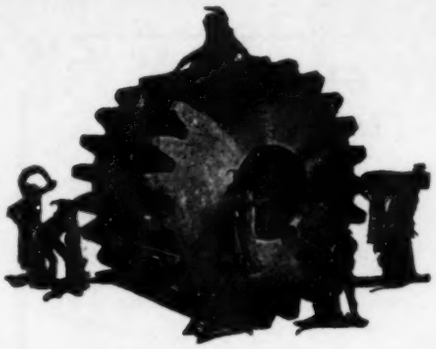

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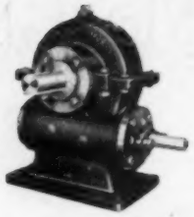

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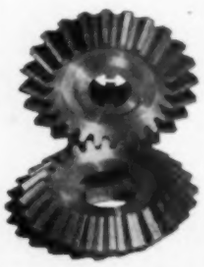

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Worm Gear Speed Reducers

SIZE	QUANTITY	RATIO	INPUT H.P. 1750 RPM	RATING AT 1150 RPM
[illegible]	73	5 1/6 to 1	3.3	2.6
	143	10 to 1	2.5	2.
	15	15 to 1	1.85	1.5
	51	20 to 1	1.4	1.1
	9	25 to 1	1.0	.9
	74	30 to 1	.97	.78
	150	40 to 1	.74	.60
	73	50 to 1	.63	.50
	50	60 to 1	.50	.39
3-3/4 HP	5	5 2/3 to 1	5.7	4.7
	3	7 to 1	4.8	3.9
	16	10 to 1	4.4	3.3
	28	14 1/2 to 1	3.2	2.5
	9	20 to 1	2.4	1.9
	43	30 to 1	1.7	1.34
	24	40 to 1	1.22	1.00
	25	50 to 1	1.05	.84
	90	60 to 1	.85	.68
7½ or 10	3	5.8 to 1	6.5	5.3
	10	10 to 1	4.56	3.72
	13	16 1/2 to 1	3.2	2.63
	25	20 to 1	2.66	2.18
	50	30 to 1	1.93	1.56
	2	40 to 1	1.47	1.21
	29	45 to 1	1.31	1.08
	48	60 to 1	.99	.81

CATALOG 114

OFFERED Subject to Prior Sale

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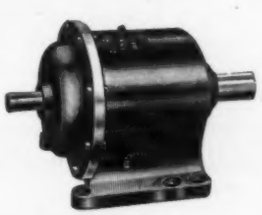

CATALOG 112

Gyro Speed Reducers

SIZE	QUAN.	RATIO	INPUT H.P. 1750 RPM	RATING AT 1150 RPM
G-7½	18	24 to 1	.87	.68
	9	30 to 1	.65	.50
	13	40 to 1	.48	.38
	8	50 to 1	.39	.30
	4	56 to 1	.35	.27
	10	60 to 1	.33	.25
	4	80 to 1	.26	.20
	4	100 to 1	.20	.18
	5	120 to 1	1/6	1/6
	3	200 to 1	1/6	1/6
	2	408 to 1	1/6	1/6
	4	480 to 1	1/6	1/6
G-15	7	30 to 1	1.3	.95
	9	40 to 1	.96	.74
	4	50 to 1	.77	.58
	25	60 to 1	.65	.47
	3	81-3/5 to 1	.50	.36
	55	120 to 1	.33	.25
	1	140 to 1	1/4	1/4
	1	360 to 1	1/4	1/4
G-25	9	40 to 1	1.5	1.
	9	50 to 1	1.25	.94
	39	60 to 1	1.04	.79
	1	66 to 1	.96	.70
	8	80 to 1	.80	.60
	9	100 to 1	.64	.44
	10	116 to 1	.55	.40
	28	118 to 1	.55	.40
	1	142 to 1	.40	.30
	10	200 to 1	.32	.25
	6	235 to 1	1/4	1/4
	1	247 to 1	1/4	1/4
	5	360 to 1	1/4	1/4
	7	480 to 1	1/4	1/4
	2	2080 to 1	1/4	1/4
G-40	2	26 to 1	4.2	3.00
	5	25 to 1	4.2	3.00
	4	30 to 1	3.8	2.8
	7	40 to 1	2.83	2.13
	6	50 to 1	2.27	1.74
	4	60 to 1	1.90	1.46
	3	101 to 1	1.1	.89
	4	120 to 1	.98	.75
	4	180 to 1	.66	.50
	1	240 to 1	.50	.38
	4	400 to 1	1/4	1/4
	3	480 to 1	1/4	1/4
	3	610 to 1	1/4	1/4
	4	1300 to 1	1/4	1/4

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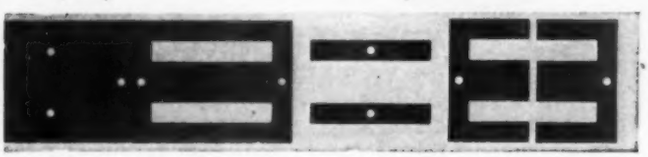

2800 pieces per minute.

The Speedmaster makes 1400 of these E's and also 1400 I's complete per stroke every minute. This is a total production of 84,000 each of E's and I's per hour, with beautifully clean edges, to precise limits. E's are 1¼x1⅞x .007" silicon steel. Die life is "15% greater than former low production methods."

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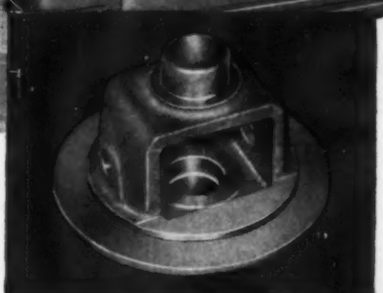
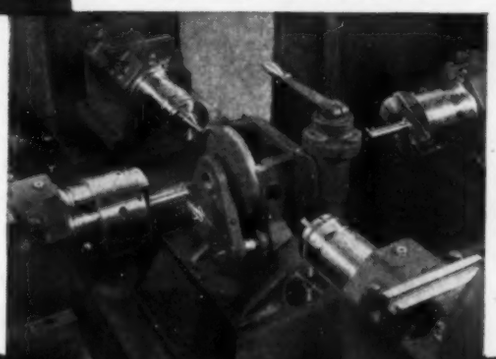
Note typical use of an Ex-Cell-O Way Machine to the right. Send for catalog with many varied applications—ask for Bulletin No. 31631.



Above: **Ex-Cell-O Four Way Precision Boring Machine. The four way units are electrically interlocked and controlled from the push button station on the right front unit.** ***Left:*** **Malleable iron differential case in which two inside counterbores are finish bored and chamfered and two cross holes are bored.**

Right: **Close-up view of part in fixture and boring spindles. Note that boring bars on left front and right rear spindles are carried on tool slides that are retracted to allow tools to enter holes, are moved out to finish inside counterbores, and again retracted for withdrawal.**



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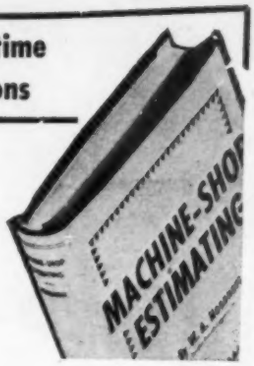

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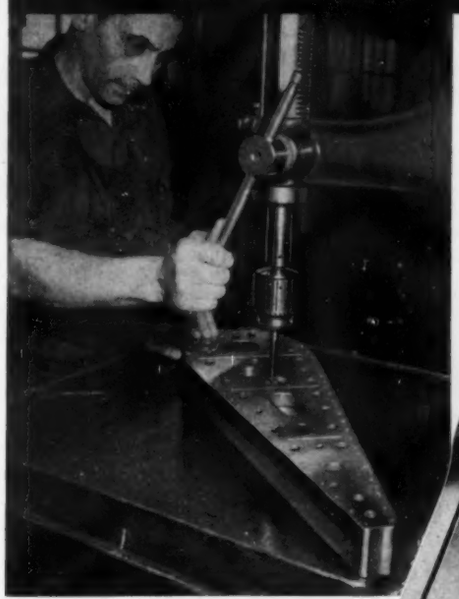

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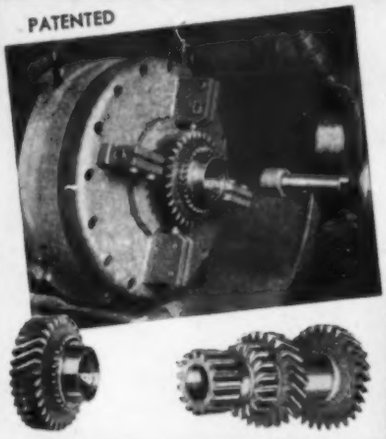

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Heavier classes of blanking and forming work can be handled efficiently and economicaly on these presses.

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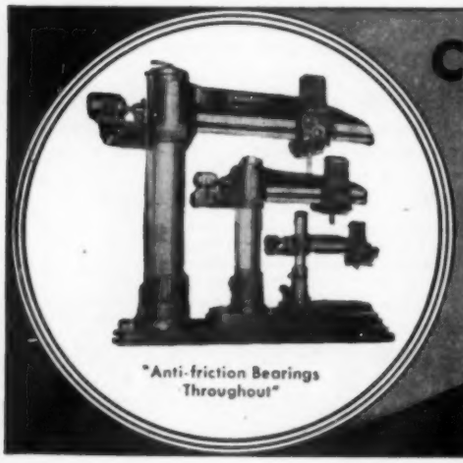

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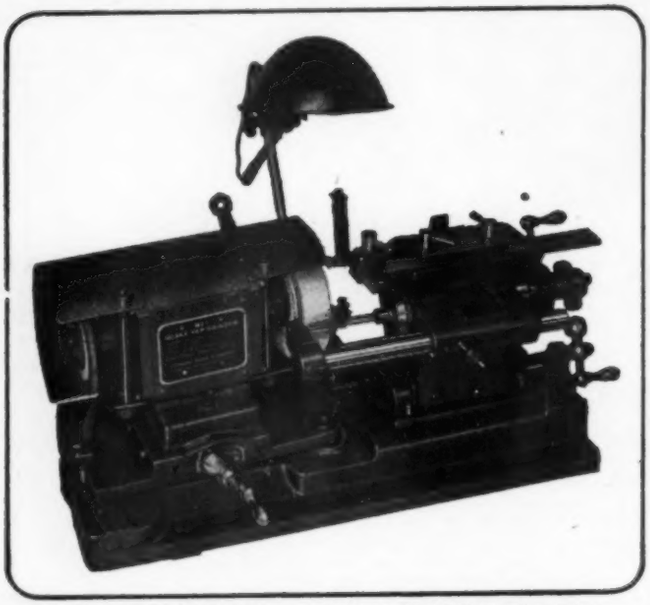

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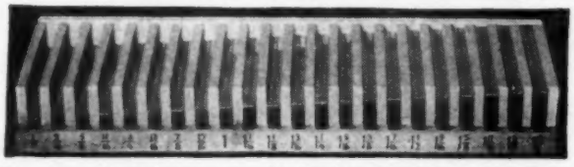

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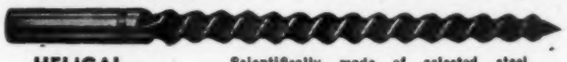

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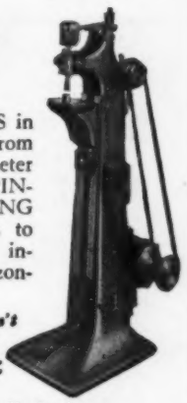

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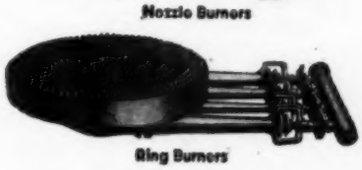

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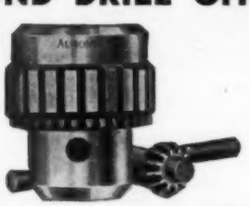

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To avoid personal injury, ruined work, and costly delays, lubricate centers, steady rests, cams and other machine parts with CMD Center Point Oil. It withstands pressure greater than 50,000 lbs. per square inch. Try it free! See for yourself!

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Without obligation, please send us a free test kit of one tube of CMD Center Point Oil and one tube of CMD Center Point Lube. Also, send 4-page folder on 30 uses for CMD lubricants.

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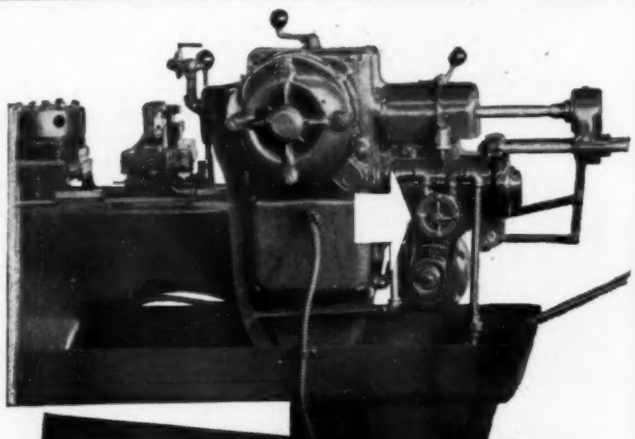

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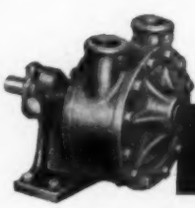

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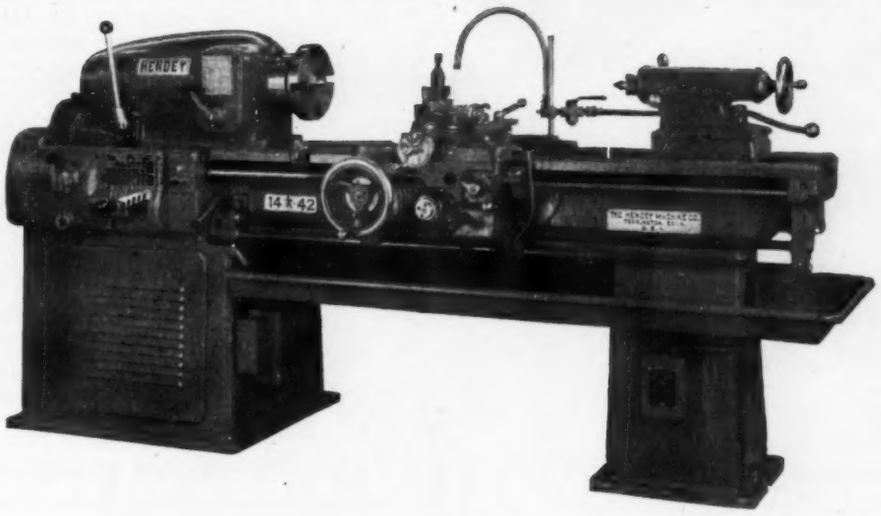
AN OUTSTANDING DEVELOPMENT

THE NEW HENDEY No. 2

GENERAL PURPOSE LATHE



First revealed at the Machine Tool Show, the new Hendey No. 2 General Purpose Lathe is an outstanding development in belt-driven lathes. It offers simpler, safer, faster and more economical operation on all types of light-duty work. Special ingenuity in designing the belt drive and belt shifting mechanism have resulted in two important operational features. First, because the spindle is not directly driven by a belt, but through a gear tooth clutch, belt tension can have no effect on spindle performance. Second, belt shifting has been made 100% safe, simple and fast. The entire belt, pulley and clutch arrangement is fully enclosed. To shift the belt, all the operator need do is pull the belt-shift lever toward himself, move it right or left to engage in the position indicated on the Spindle Index Plate. Four initial spindle speeds are immediately available and, when combined with the back gears, the number is increased to eight, ranging from 30 to 1142 r.p.m.

Other important features of the new Hendey No. 2 include a quick change gear box offering 48 different thread and feed changes, preloaded anti-friction bearing mounted spindle, automatic lubrication throughout, super precision lead screw, bridge truss bed construction and spindle accurately indexed for multiple thread cutting.

The new Hendey No. 2 is truly the last word in belt-driven, general purpose lathes. It will pay you to investigate it thoroughly. Write for complete details today.

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Main Office and Plant **— Torrington, Connecticut**

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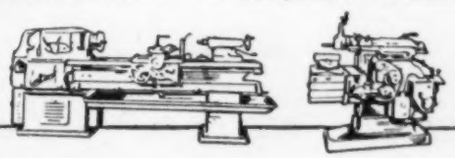
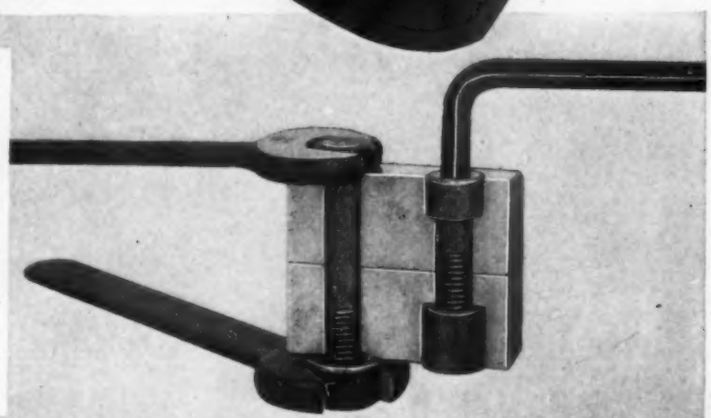


TOOL ROOM LATHES
12" - 14" - 16" - 18" - 20"

SHAPERS
12" - 16" - 20"

New

internal wrenching self-locking nut by ALLEN



Comparison of ALLENUT, used with Allen Socket Head Cap Screw, and conventional bolt and nut. Note how internal wrenching principle contributes to designing that saves space and material. Clearance for open end or box type wrenches not required.

ALLENUT

This new internal-wrenching nut *holds* with a weld-like grip,— *self-locking* in non-hardened metals. Knurled flutes are drawn down into counterbored hole as screw is tightened in nut. Yet easily removed without damage to nut or containing parts by backing off on screw and tapping screw on head.

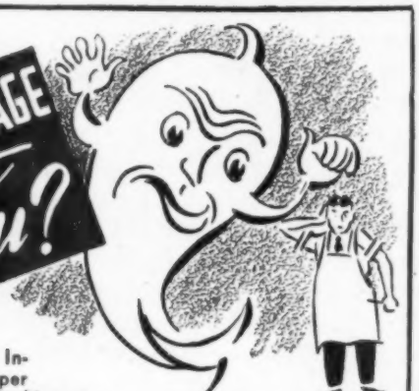
Using *ALLENUTS* with Allen Socket Head Cap Screws, the positive *internal* wrenching action of Allen Hex Keys drives fast, firm set-ups in the harder metals. 12-point (double-hex) Allenut socket gives 30° of wrenching swing — as compared with a normal 60° — to speed up assembly in cramped quarters.

The *ALLENUT* sets up *flush* to achieve streamlined surfaces. It facilitates more compact designs with resulting economies in space, weight and material. Adds immensely to the finished appearance of any job... Precision-made of special-alloy steel to Allen standards; threads tapped to a Class 3 fit.

Ask your local Industrial Distributor for samples for test applications. Available only through authorized ALLEN Distributors.

The Allen Mfg. Company ★ ALLEN ★ Hartford 1, Conn., U. S. A.

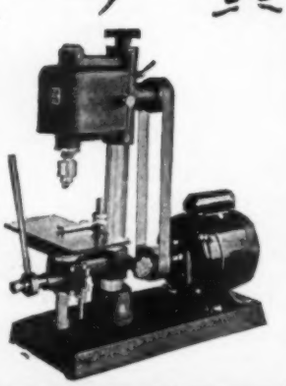
TAP BREAKAGE Haunt You?



Banish the spectre! Install the Hamilton Super Sensitive Tapping Machine, a specialist in precision tapping of small holes (from the smallest and finest tap to 10-32 inclusive).

Patented power transmission and adjustable stops permit tapping of blind holes to the very bottom without tap breakage. Spindle idles in reverse while tap is being centered. Pressure to feed lever changes spindle rotation. Release of pressure reverses and withdraws tap.

Get complete description and specifications. Write for Bulletin T-47.



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¾ SIZE

Operate at grinding-wheel speeds
Outlast scores of mounted points
Cut 50 times faster
MANY SHAPES and SIZES
Cut hard materials - Rockwell 65-C

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SEVERANCE TOOL INDUSTRIES, INC.
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Put Your Stop Watch on NICHOLSON EXPANDING MANDRELS

Test the time-saving possibilities of these widely used precision tools. Not infrequently time studies show operations can be completed in less time than was formerly consumed in looking for or turning a solid arbor. No parts to wear out and cause distortion. Sold singly or in sets; for bores ½" to 7". Bulletin 1043.

W.H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.

THE Sides OF A V-BELT ARE WHAT Grip the Pulley, Pick-up the Load AND REALLY Get the Wear!

Diagram of V-Belt in Sheave-Groove

THAT'S WHY THE Concave Side (A GATES PATENT) IS IMPORTANT TO YOU!

Every ounce of load a V-Belt carries must *first* be picked up by the *sides* of the belt. Clearly so, because *only* the *sides* come into contact with the pulley! The sides do all the *GRIPPING* on the pulley. They get all the wear against the sheave-groove wall. The sides *pick up* the load. They transmit that load to the belt as a whole. And then, once more, the sides—and the sides *alone*—grip the driven pulley and *deliver* the power to it.

That is why you have always noticed that the sidewall of the ordinary V-Belt is the part that wears out first.

Clearly, since the sidewall is the part that wears out first, anything that prolongs the life of the sidewall will lengthen the life of the belt—and that's why the patented Concave Side is important to you.

The simple diagrams on the left below show exactly why the ordinary, straight-sided V-Belt gets excessive wear along the *middle* of the sides. They show also why the Patented Concave Side greatly reduces sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belts can possibly give.

and the CONCAVE SIDE is more important NOW than ever before!

Now that Gates SPECIALIZED Research has resulted in Super Vulco Ropes capable of carrying much heavier loads—fully 40% *higher horsepower ratings*—the sidewall of the belt is called upon to do even more work in transmitting these heavier loads to the pulley. Naturally, with heavier loading on the sidewall, the life-prolonging Concave Side is more important *now* than ever before!

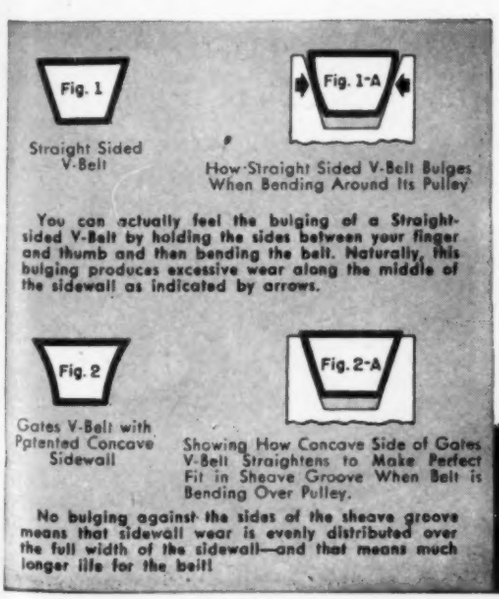
Fig. 1
Straight Sided V-Belt
Fig. 1-A
How Straight Sided V-Belt Bulges When Bending Around Its Pulley
You can actually feel the bulging of a Straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.
Fig. 2
Gates V-Belt with Patented Concave Sidewall
Fig. 2-A
Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt is Bending Over Pulley.
No bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!

Gates

The Mark of SPECIALIZED Research

THE GATES RUBBER COMPANY
"The World's Largest Makers of V-Belts"
DENVER, U. S. A.

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GATES VULCO ROPE DRIVES
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

Presstite Engineering Co. Says CURTIS AIR COMPRESSOR "Completely satisfactory in 24-hour service"

In the plastic division of Presstite Engineering Co., St. Louis, this Curtis Air Compressor is the sole source of air — and because compressed air is essential to all types of plastic extrusions, dependability is all-important. Operating continuously 24 hours a day, this Curtis Compressor has given "completely satisfactory service."

This is another example of a nationally known manufacturer relying upon Curtis Compressors for a dependable, economical supply of air. Curtis features that contribute to their excellent record of performance, long life and low maintenance include:

- Timken Bearing Equipped
- Automatic Electric Welded Tank
- Positive Unloaded Starting
- Precision Built Throughout
- Self Oiling

Write for full information on Curtis Air Compressors from ¼ h.p. to 50 h.p. for every industrial use. Simply fill in coupon below and mail today.

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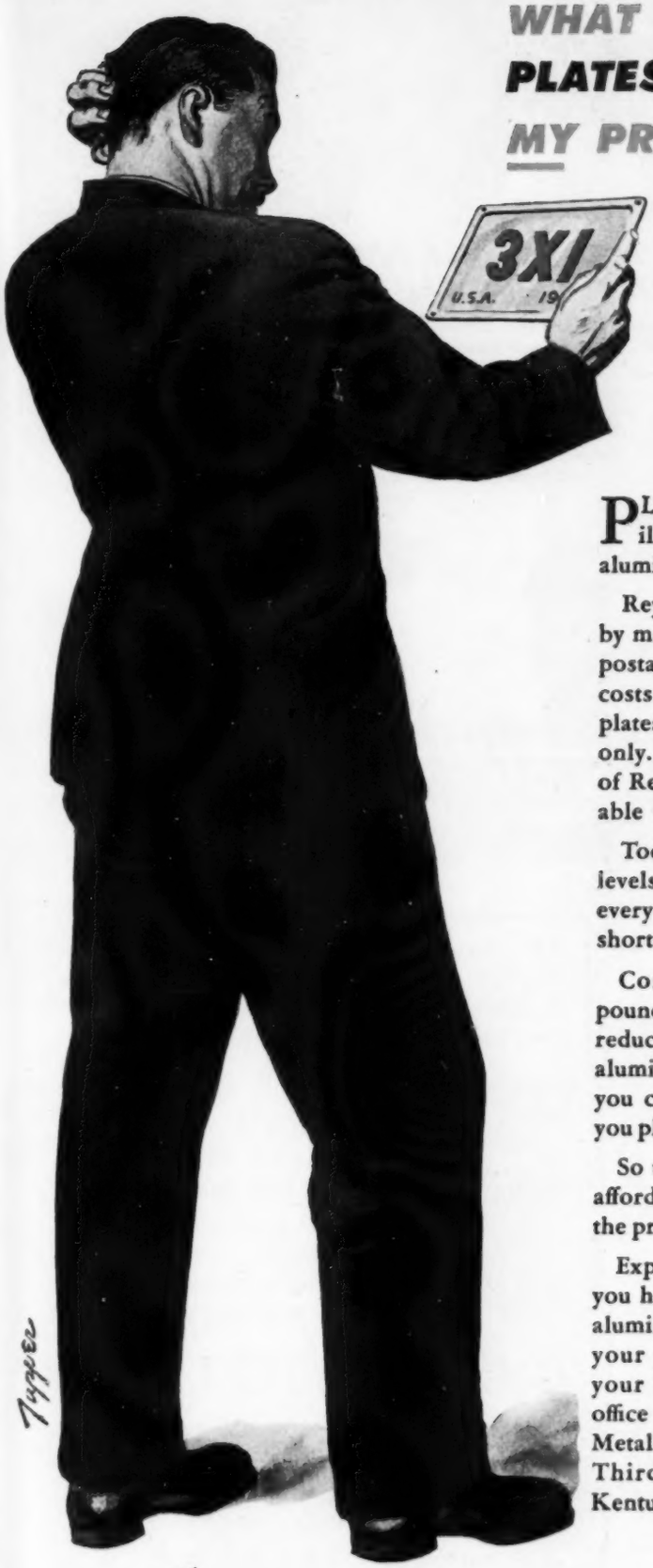
S

WHAT HAVE ALUMINUM LICENSE PLATES GOT TO DO WITH MY PRODUCT?



PLENTY, because here is another practical case history illustrating how a change from traditional materials to aluminum lead to both lower costs and an improved product.

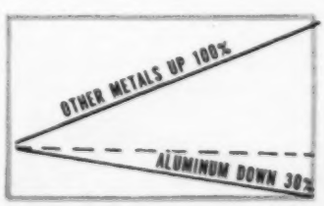
Reynolds Aluminum for license plates is now being used by many states. Where these lightweight plates are mailed, postage savings alone can mount up to 6¢ per set. Painting costs are cut an estimated 2½¢ per set because aluminum plates, unlike those of steel, require painting of the numbers only. Rust can never disfigure these plates and, when made of Reynolds embossed aluminum sheet, they offer remarkable visibility without any glare.

Today's cost of Reynolds Aluminum is well below prewar levels. With 3 times more metal surface for production in every pound of aluminum you buy—there's no need to let shortages of other metal keep your product out of the market.

Consider the advantages of more workable metal per pound, less waste in production, no cost for rust-proofing, reduced shipping cost, reduced labor expense because aluminum is light to handle and faster in fabrication—then you can appreciate just how much more aluminum offers you plus many more points to please and sell your customers.

So the only cost in connection with aluminum you can't afford is the cost of having your competitor discover first the production and sales advantages of Reynolds Aluminum.

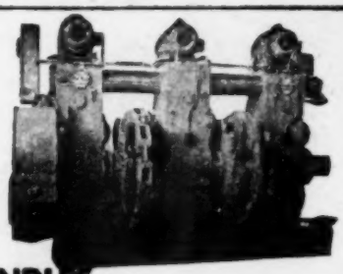
Experienced technicians from Reynolds will gladly advise you how the correct type of aluminum can be adapted to your production. Contact your local Reynolds field office or write to Reynolds Metals Company, 2523 South Third Street, Louisville 1, Kentucky.



The price of aluminum has gone down 30% since Reynolds became a primary producer in 1939.

REYNOLDS *Lifetime* ALUMINUM

Roto-Matic MILLERS



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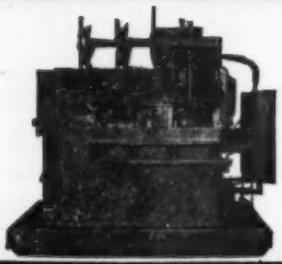
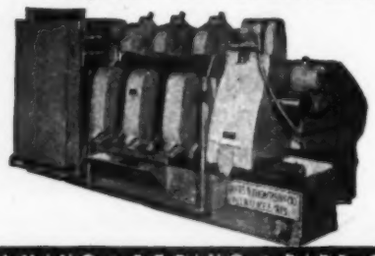
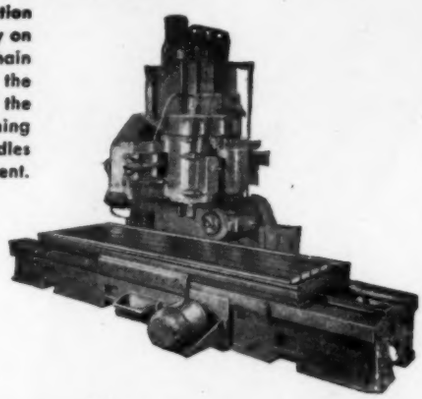
The ROTO-MATIC principle of continuous production insures the maximum of production and accuracy on any job to which a Miller has been adapted. Chain clamping mechanisms, where adapted, leave the operator free to load and unload parts. On the larger type Rotary Drum Type Millers finishing spindles are adjustable for toe cut. All spindles have provisions for micrometric endwise adjustment.







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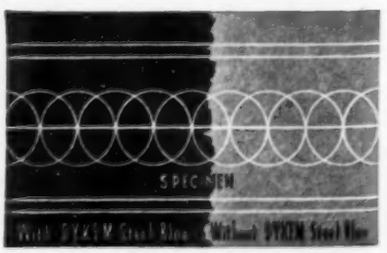

Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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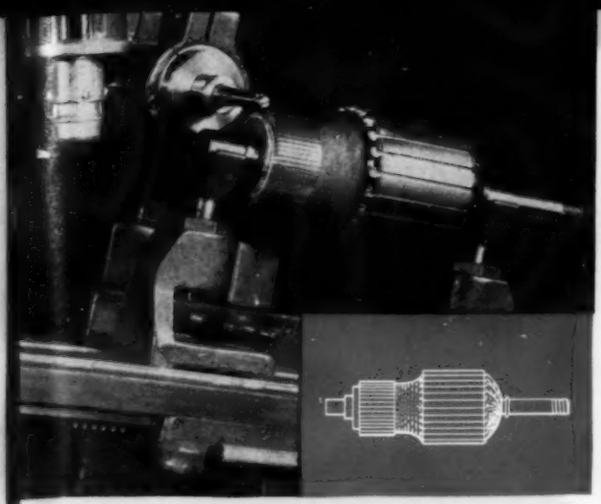
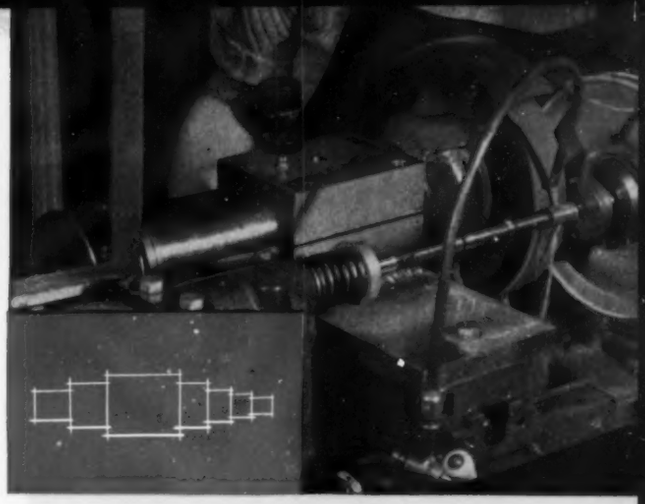
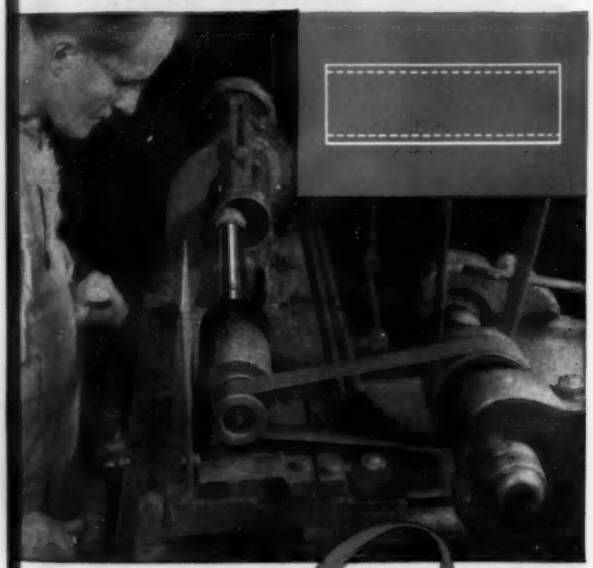


illing mica segments in small-motor commutators
r this precision under-cutting job Hullhorst Micro Tool Co., Toledo, uses this special bench-mounted set-up with an in-erchangeable-spindle type T quill, mounting a milling cutter.

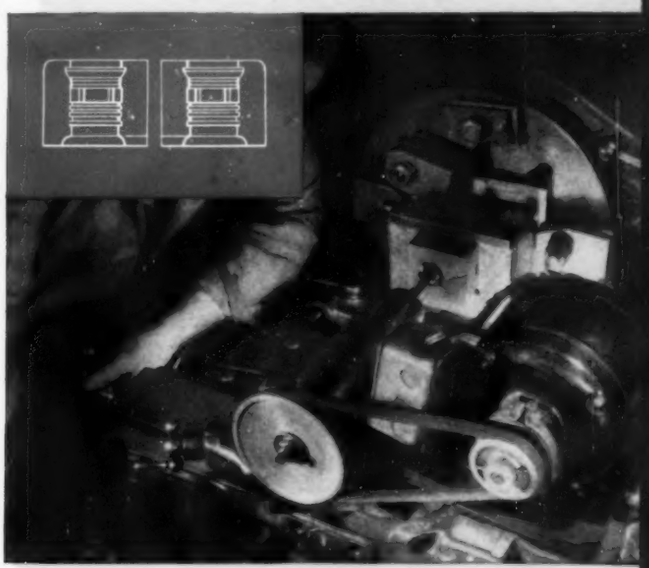


Grinding several plunge cuts on small crankshaft
In manufacturing small crankshafts, the General Gas and Electric Company of Kalamazoo, Michigan, used a belt-driven Dumore Z Quill mounting an 8" wheel for plunge-cut grinding.

inding I.D. of cylinder sleeve for Diesel engine
order to utilize a toolroom over-head belt-drive, the Buda mpany, Harvey, Ill., devised a special mounting bracket for umore Quills. A lathe-mounted X-8 Quill is shown on a ep internal grinding job on a diesel engine cylinder.



Milling threads in steel molds for castings
Chicago Impression Die and Mold designed this lathe-mounted milling machine along the lines of a Dumore Grinder. Here, it is milling female threads in mated steel molds mounted with a U-clamp on the faceplate of a lathe.



The *Quill* of a lifetime—

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A Dumore Quill is death on excessive costs. This versatile tool can often help you avoid unnecessary investment in expensive machines . . . and its adaptability cuts actual operating costs in toolroom, maintenance, and production work.

You can do more for less with Dumore Quills — in three different ways. *Use them with Dumore Grinders;* their interchangeable design adapts one Dumore for dozens of different jobs. *Use them as work heads in special set-ups;* they enable you to build your own dependable production equipment at minimum cost. *Use them on standard machines* as replacement spindles, or as high-speed attachments.

Capitalize on the adaptability of this precision quill *for all types of grinding, plus drilling, and light milling.* You have a selection of 25 sizes and types — all designed for ± .0001" accuracy at speeds up to 42,500 rpm; internal grinding to 24" depths. *A Dumore does more for you — why not do more with Dumores?* Call your distributor today!

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Turn the page for information on other Dumore Tools. ——▶

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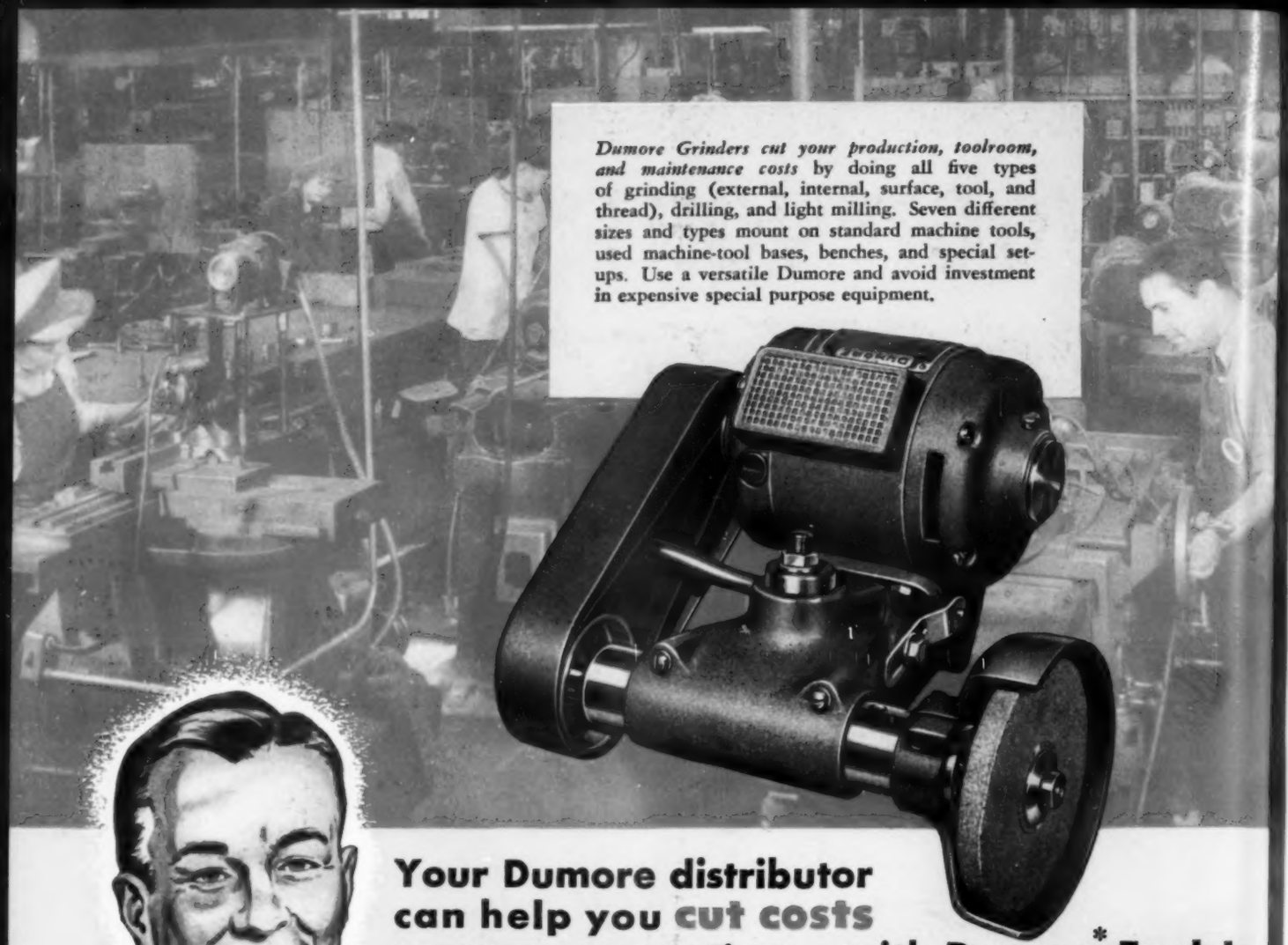

Dumore Grinders cut your production, toolroom, and maintenance costs by doing all five types of grinding (external, internal, surface, tool, and thread), drilling, and light milling. Seven different sizes and types mount on standard machine tools, used machine-tool bases, benches, and special set-ups. Use a versatile Dumore and avoid investment in expensive special purpose equipment.

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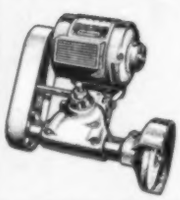
Turn the page for special information on cost-cutting DUMORE QUILLS



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AD-32A

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Excellent bearing qualities • High strength-weight ratio • High compressive strength • High impact and fatigue values • Corrosion resistance • Wear resistance • Efficiency at extreme temperatures.

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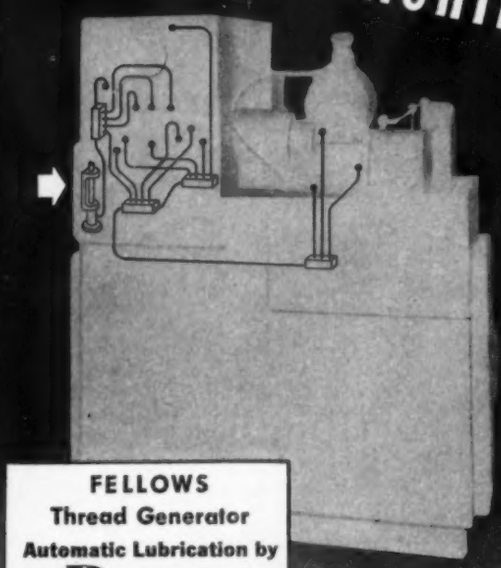

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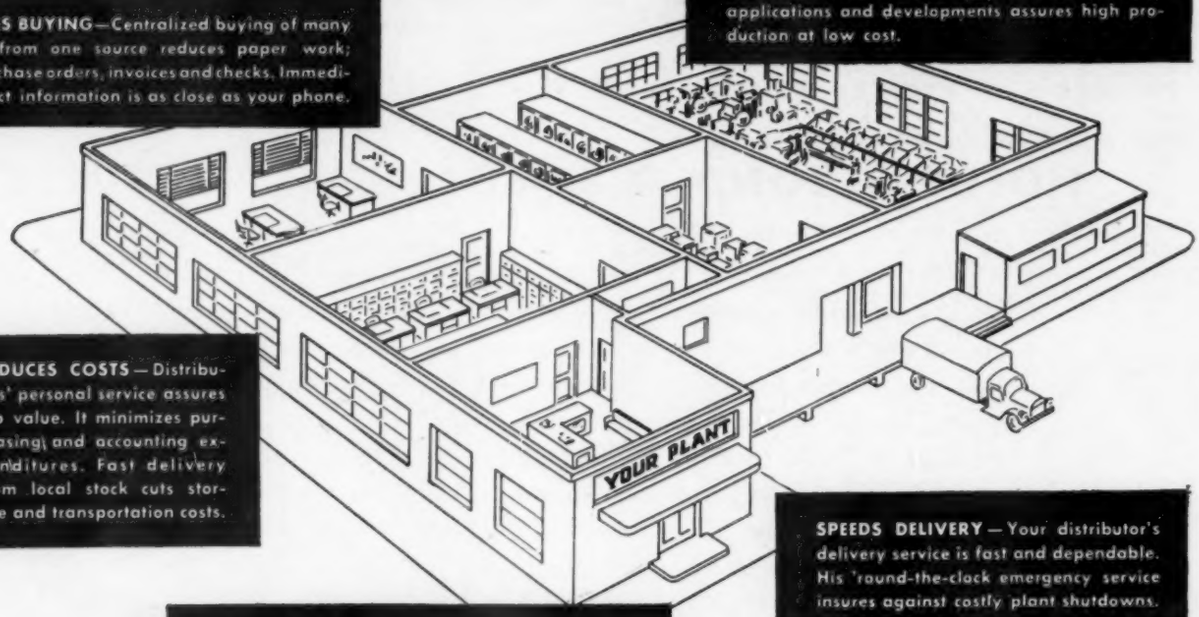

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▸ Your LOCAL INDUSTRIAL DISTRIBUTOR buys and maintains large stocks of industrial equipment, tools and supplies to meet your daily production and maintenance requirements. His stocks, assembled with foresight from sources scattered across the continent, are your bulwark against serious production delays. On unusual or hard-to-get items, he acts as Your Procurement Agent and Expeditor.

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Published by MILL SUPPLIES in the interests of your local industrial distributor

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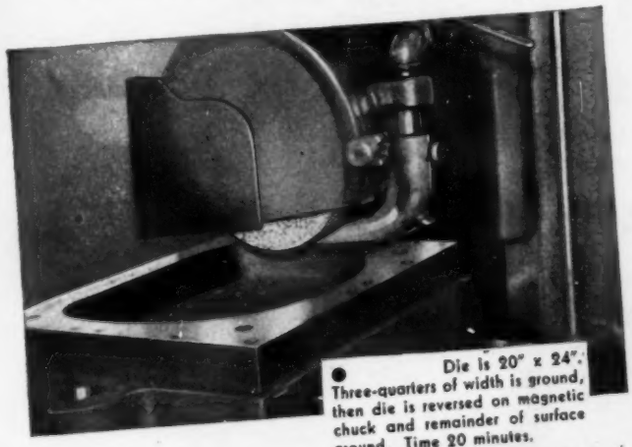
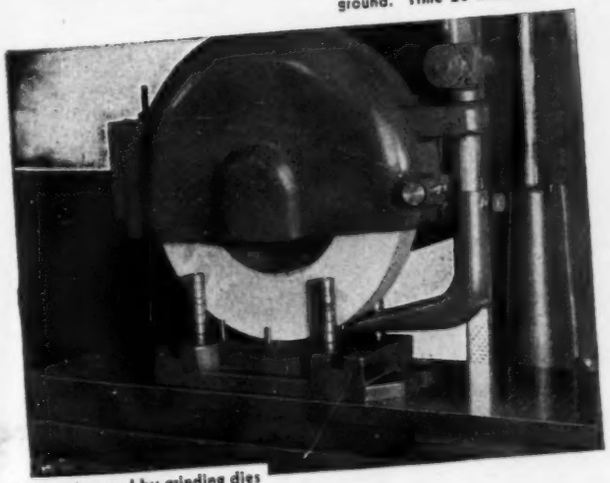
A GREAT variety of die work can be speedily and easily handled on the Mattison Surface Grinder. Its large capacity, ability to hog off stock and high power, keeps the 'time out' periods to a minimum.

A few examples of die jobs ground on the Mattison at a considerable saving in time, are shown on this page. Die shown in the lower left hand corner was ground with leader pins in place at ⅓ of former time. Wheel and spindle clearance of Mattison Grinder is sufficient to handle this type of work with ease, eliminating time required for disassembly and alignment when leader pins are removed.

For further data regarding use of Mattison Grinders for reconditioning dies, ask us to send you free set-up book on this subject.

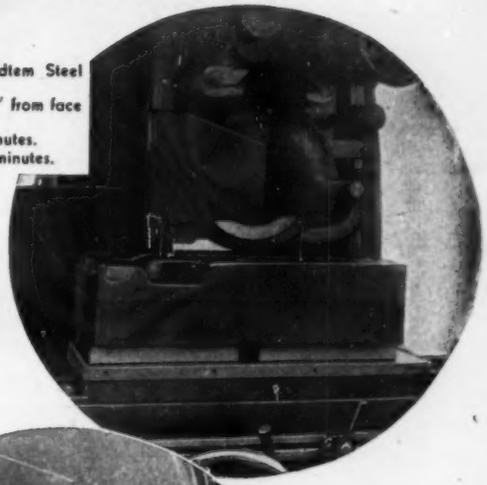


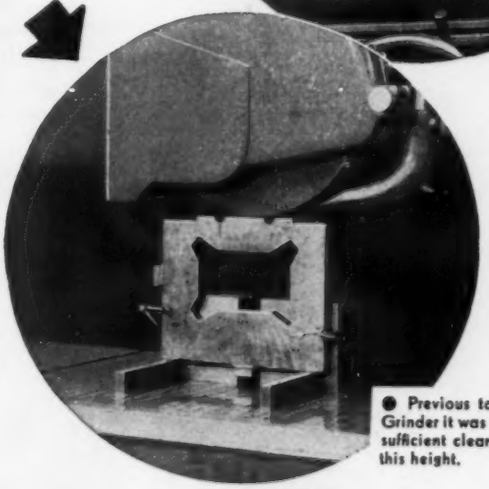
● Die is 20" x 24". Three-quarters of width is ground, then die is reversed on magnetic chuck and remainder of surface ground. Time 20 minutes.



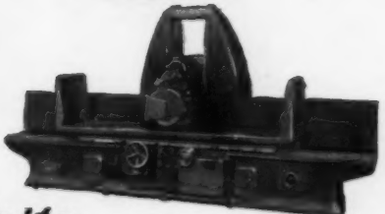
● Time is saved by grinding dies with leader pins in place.

● Material: Hardtem Steel Forging die.
Stock Removed: $\frac{1}{64}$" from face side.
Present Time: 8 minutes.
Previous Time: 30 minutes.



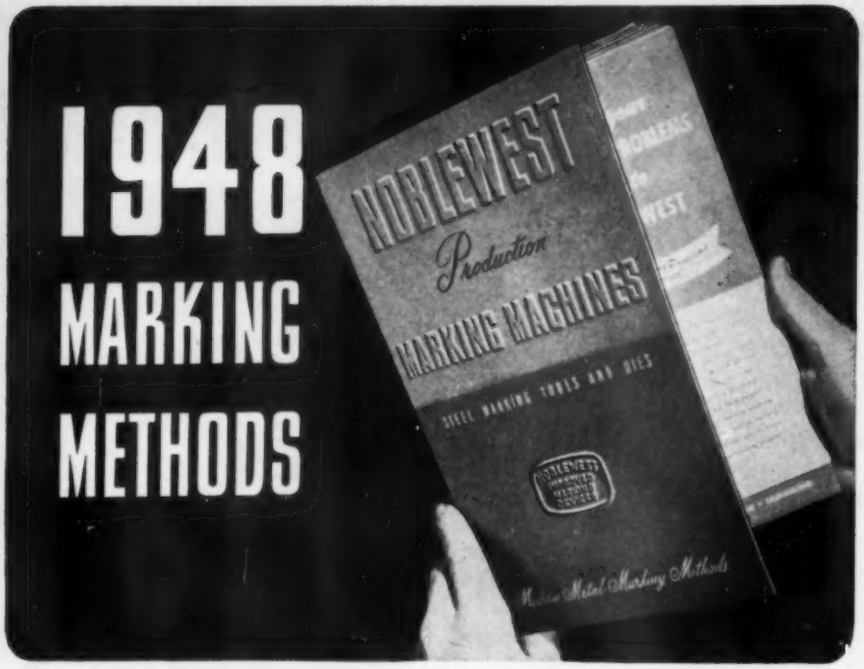


● Previous to obtaining Mattison Grinder it was not possible to obtain sufficient clearance to grind dies of this height.



Write for Free Set-up Book containing further examples, showing how others have reduced time and cut costs with Mattison Grinders.

MATTISON MACHINE WORKS
ROCKFORD • ILLINOIS



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AMERICAN MACHINIST

Magazine of Metalworking Production

330 W. 42nd STREET
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CUT YOUR PRODUCTION COSTS
On Jobs Requiring
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Sunnen Precision Honing may cut your production costs in one or more ways. The experience of many manufacturers has shown that production of accurate straight round holes can be increased from 150% to 600%.

Because you can hold a tolerance of .0001" and less, costly rejects are held to a minimum.

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With the Sunnen Precision Honing Machine you can produce a full bearing surface in any hole — in steel, cast iron, bronze, aluminum, carbide, ceramic, plastic or glass — with a guaranteed accuracy of .0001". A complete line of abrasives is available to produce any degree of surface finish desired.

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This versatile machine is quickly and easily set up. No jigs or fixtures are required. It is low in cost and economical to operate. Parts often are honed in less time than they can be chucked in other types of finishing equipment.

Sunnen Honing can provide real savings in long-run production costs, and even greater savings on short runs when frequent size changes are necessary.

Find out how these advantages can be applied in your plant. Call in a Sunnen engineer or write for complete information.

Range .120" to 2.625" diameter.

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Line reamer bushings, diameter 2.375", accuracy held to .0001".

Miniature aircraft cylinder — smooth, accurate honing provides better compression and longer life.

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

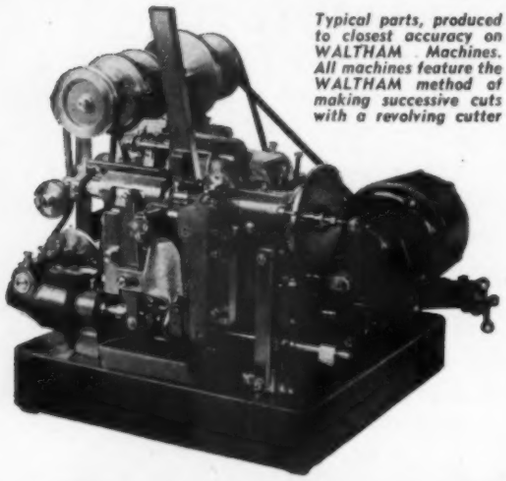
Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

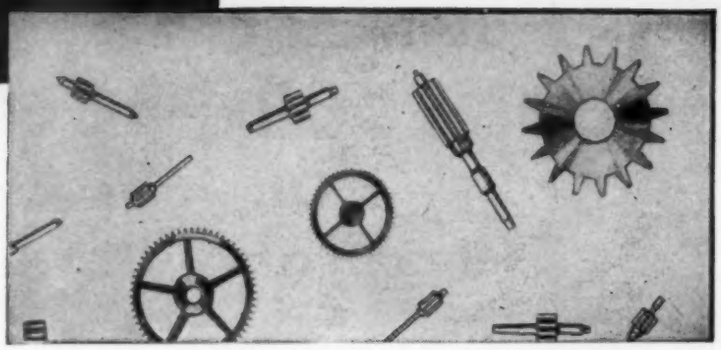
Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

WALTHAM
PINION & GEAR CUTTING MACHINES

for precision production of fine pitch mechanisms



Typical parts, produced to closest accuracy on WALTHAM Machines. All machines feature the WALTHAM method of making successive cuts with a revolving cutter



Single-Cut Pinion Machines This machine employs one cutter. Blank is positioned and machine started by hand, all other movements being automatic.

Multiple-Cut Pinion Machines Two or three cutters on arbor of cutter spindle make successive cuts. Machine stops on completion of last cut.

Magazine-Fed Pinion Machines Provides continuous production of one kind of pinion. Magazine is loaded and all other operations including cutting and ejecting are automatic and continuous.

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Write for literature giving detailed specifications

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
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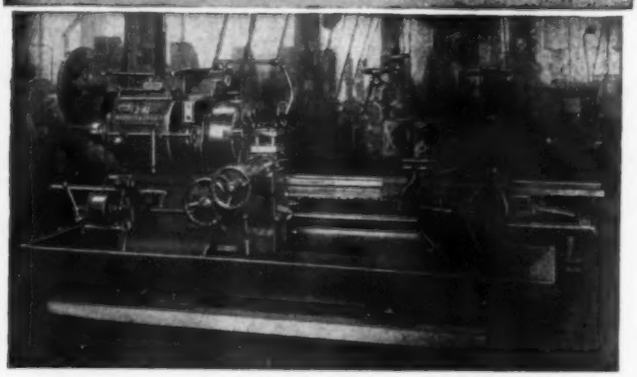

We're tooling up to cut your gears to post-war standards of accuracy . . . and at post-war speed. We've added to our modern equipment (we already have the necessary "know how") to produce gears to your most exacting specifications—and produce them fast! For spurs up to 72" P.D. 1 D. P. . . . for bevels to 54" P.D. 1 D.P., spirals and helicals to 38" P.D. 2 D.P., worm gears to 48" P.D. 2 D.P. . . . for fabroil, bakelite or rawhide gears . . . any size . . . for racks to 20' long 3 D.P., or internals 25" P.D. 3 D.P.—get a Stahl estimate first!

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before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommel, Registered Patent Attorneys. Suite 453, 815-15th Street, N.W., Washington 5, D. C.

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20"x10' American, Q.C.G.
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18"x8' Lodge & Shipley geared head
18"x7' Lehman, Q.C.G. M. Dr.
18"x6' American, Geared Head, MD.
16"x8' Hendey, Q.C.G. M. Drive
16"x6' Lodge & Shipley Geared Head
14x8' Rockford, Q.C.G. Collets
14"x8' Pratt & Whitney, Q.C.G. Collets
14"x6' LeBlond, Q.C.G. M. Drive
14"x6' American, Q.C.G. M. Drive
14"x6' Mulliner-Endlund, M. Drive
14"x6' Hendey, Q.C.G. M. Drive
14"x6' Rockford, Q.C.G. M. Drive
12"x30" American, Wood Spinning
12"x5' Sidney, Geared Head
12"x5' Hendey, Q.C.G. M. Drive
12"x3' Craftsman, Bench, M. Drive
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Simmons, Microspeed, 1" Cap. M. Dr.
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W-Swasey #2A, Univ. 2½" Cap.
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"A" Norton, 10x18 Cylindrical
"A" Norton, 10x72 Cylindrical
"A" Norton, 10x84 Cylindrical
#2 Norton, 10x32 Univ. Tool & Cutter
#11 B&S 10x30 Cylindrical
#10 B&S 6x18 Cylindrical
#4 B&S Univ. 12x60 Cylindrical
#12 Greenfield, Internal Hydromatic
#70 Heald, Internal, Grinds 11" deep
#2 Cinci. 6x36 Univ. Cylindrical
#2 Cinci. Centerless, Motor Dr.
#51 Oliver, Drill Pointers, 1½" cap.
24" Blount Wet Grinder
Besley Dble. End Disc, 30" Discs
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96" Seybold, Knife Grinder
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#2 Van Norman, Duplex Mill
#4 Cinci. Vert. High Power
#2 Kempsmith, Horiz. Plain
#1 Kempsmith, Horiz. Plain
#5C Becker Vertical Mill
#3, #4, #5 Cinci. Horiz. Mills
#31 Lucas, Horiz. Boring, 3" Bar
#0 Giddings & Lewis, Horiz. Boring Mill—3" Bar, Motor Drive

DRILLING MACHINES

Natco #12, 20 Spdles. 3/16" Cap.
Natco #D6, 24 Spdles. 5/16" Cap.
Natco #D5, 14 Spdles. 5/16" Cap.
Fox #15, 54 Spdles. #1 m.t. 3/16 Cap.
Minster #2D, Sgle. Spdle. Upright, compound table, #5 m.t. Heavy Duty
Cinci-Bickford, 3½' arm, 9" col. Radial
Cinci-Bickford, 4' arm, 11" col. Radial
Cinci-Bickford, 5' arm, 13" col. Radial
Fosdick, 5' arm, 14" col. Radial, M. Drive
Cinci-Bickford, 6' arm, 15" col. Radial

SHAPERS & PLANERS

Pratt-Whitney Vert. Shaper, 6", M. Dr.
Logan 7" Horiz. Shaper, Motor Drive
Machinery Sales 16" Crank Shaper
Gould & Eberhardt 24" Crank Shaper
Gould & Eberhardt 16" Crank Shaper
American 24" Crank Shaper
New Haven 12" Vertical Shaper
Whitcombe, 24x24x6 Planer
Niles-B-P, Shaper-Planer, 20x20x24
Steptoe 16" B.G. Shaper, M. Drive
Betts, 120x72"x35' Planer
Ingersoll Planer Type Mill, 30x30x12

POWER PRESSES

Standard #1 "A", 6 tons, floor type
Bliss #68C Double Action Press
Hilles & Jones #4 Single End Punch & Shear, 48" Throat, equipped as Plate Shear with 18" Blades, Cap.—1¼" thru 1" arranged motor drive
Bliss #76½B, Single Crank Geared Press, 7" Shaft, 3" Stroke, Motor Drive
Horton-Ackerly, 6 tons Bench Presses
Caldwell, 200 Tons, Hydraulic, Horizontal Wheel Press, 36" Dia. Cap.
Lucas 15 Tons, Power Arbor Press, M. Dr.
Bliss-Consolidated #163B, S.S. Dble. Crank Press—Bed 42"x24", Motor Drive
Clearing 200 Tons, S.S. 10" Stroke, M. Dr.
Federal #5 O.B.I. 49 Tons, M. Dr., 5" Str.
Michigan O.B.I. 36 Tons Cap., 2" Stroke
General 8 Tons, Flexible Power Press, M. Dr.
Ferracute #EG52 Geared Coining Press, 150 Tons Cap., up moving ram
Baxendale O.B.I. 11 Tons, 1½" Stroke
Zeh & Hahneman, Single Action Cam Press, Spring Return Type, 35 tons cap.

LATHES

8"x15" Sundstrand, Model D
10"x22" Sundstrand, Model AA
12"x18" Lipe Carbo
12"x5' Sebastian
14"x6' Hendey
18"x6' American
20"x10' Lodge & Shipley
20"x25" Fay
22"x48" Centers Monarch (1942)
36"x30' Lodge & Shipley
50"x17' cc LeBlond

MILLING MACHINES

No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. High Power
No. 3K Milwaukee Vertical (1942)
24" Cincinnati Production
No. 2-18 Cinn. Rise & Fall (1941)
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 5-48 Cinn. Hyd. (1942)
No. 45-48 Cinn. Hyd. Duplex Tracer (1943)
No. 56-90 Cinn. Hyd. (1943)
No. 2 Hanson-Whitney Thread
4"x9" Hanson-Whitney Univ. Thrd. Miller
6"x20" Pratt & Whitney, Model C
6"x36" Lees-Bradner Thread Miller
12"x54" Lees-Bradner—Model HT (1943)
4" Taylor & Fenn Spline, M.D.
24"x24"x12' Ingersoll Adj. Rail
54"x36"x10' Ingersoll Adjustable Rail
60"x48"x12' Ingersoll Adjustable Rail

DRILLS

24"—6 Spdl. Demco
No. 121 Baker
No. 217 Baker—(1943)

ReMANUFACTURED MACHINE TOOLS

-(ORIGINATED BY US)-

Reg. U.S. Patent Office

No. D-8 Colburn No. 6 M. T.
No. 2 LMS—26"—2 Spdl. L-G (1945)
No. 2LMS—14"—3 Spdl. L.G.
No. 2 LMS—20"—3 Spdl. L-G (1943)
No. 2 LMS—14"—4 Spdl. L-G
No. 2 LMS—26"—4 Spdl. L-G
No. 2 LMS— 26"—6 Spdl. L-G
No. 2—8 Spdl. Leland-Gifford
7'-15" Col. American Full Universal
7'-15" Col. Carlton, Motor on Arm

VERT. BOR. MILLS

34" King
42" Bullard New Era
72" Cincinnati
72" Niles Extra Heavy
84" Betts

HOR. BOR. MILLS

No. 31—3" Bar Lucas
No. 3A—3" Bar Universal
Rockford, 3⅛" bar
No. 360-F Giddings & Lewis (1942)
No. 560-F Giddings & Lewis (1942)

GEAR MACHINES

No. 7 Fellows Gear Shaper
11" Gleason Bevel Gear Cutter

PLANERS

36"x36"x12' Cincinnati, 4 Heads

MISCELLANEOUS

Model H-7 Micromatic Vert. Honer
2500 Ton Lake Erie Hydraulic Press
No. 22-C Racine Shear Cut Hack Saw

TURRET LATHES

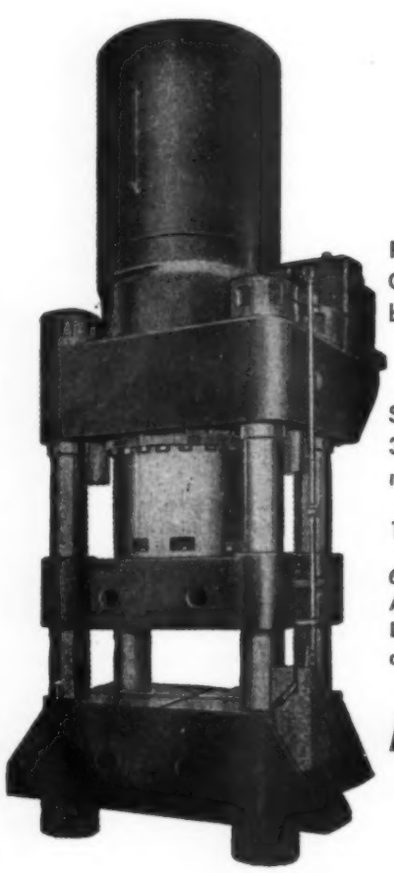
No. 2 B. & S. Screw Machine, Wire Feed
No. 601 Oster Rapiduction
No. 3 Jones & Lamson (1942)
No. 3 Bardons & Oliver, Bar Feed
No. 4 Gisholt (1942)
No. 5 Warner & Swaseys (1942)
No. 5 Bardons & Olivers (1942)
No. 5 Foster, A.C. & Bar Feed (1942)
2-A Warner & Swasey
6R Denver
18" Libby, 3½" H.S.
No. 49-675—New Britain Gridley—7½" Cap.

GRINDERS

4"x12" Landis, Model H
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x36" Norton Type C Plain (1943)
16"x72" Norton Type C Plain (1944)
Norton Motor Driven Plain Grinders
6"x18" to 24"x240"
10"x24" Landis Type C Universal
12'x36" Landis Type LCH Universal (1945)
16"x16"x48" Thompson Hyd. Surface
No. 34 Abrasive Surface (1943)
No. 22—12" Heald Rotary Surface
No. 25A—16" Heald Rotary Surface (1942)
10"x72" Colonial Broach Grinder

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BLVD. CHICAGO 6, ILL.



1300 TON WATSON STILLMAN HYDRAULIC PRESS Self Contained

Platen size 48" x 42". Stroke 22". Opening 37. Ram Diameter 35". Driven by 50 H.P. Motor, Also

600 TON ELMES PRESS

Self contained 48x45" between rods, 36" stroke, 66" openings, 75 H.P. motor, 3 phase, 60 cycle, 220v.

1320 TON PRESS, SELF CONTAINED

600 Ton Self Contained Lake Erie Double Action Press with 175 Ton Cushion Cylinder. Distance between rods 48"x60", Stroke 30", opening 48".

Aaron Machinery Co.

Incorporated

45 CROSBY ST., N. Y. C.

Tel. CAnal 6-0421

UNUSUAL VALUES

Milling Machines—#1, Universal, #1 American (new) plain, #1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe #3—26", Gould & Eberhardt 42".

Grinders—Cylinder, B & S #11, Planer type 16"x36", Surface 12"x62", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—16"x6', 8', 10'—18"x6', 8', 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized. Large stock 10" and 12" bench and floor type.

Planers—Single head 24"x6', 24"x8', 28"x8'.

Shapers—16", 20", 24", B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 36", 40".

SPECIAL—New totally enclosed, dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

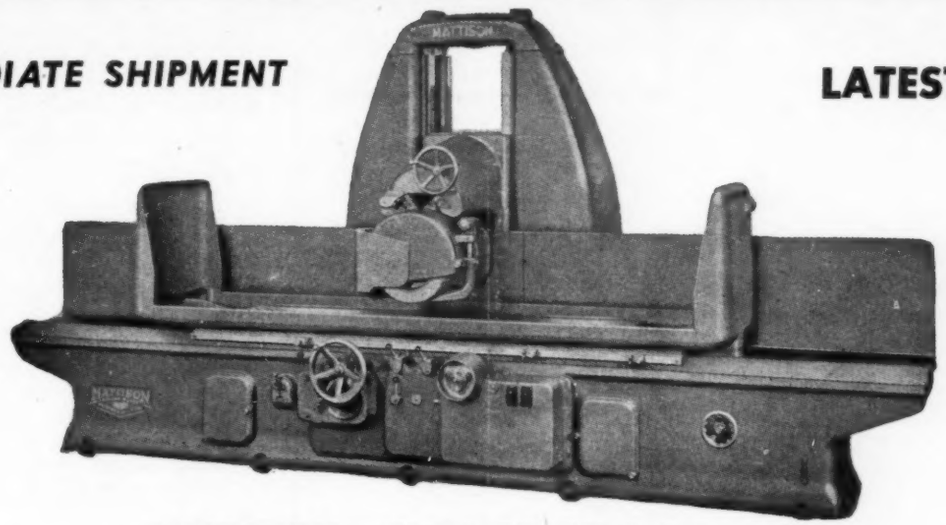
Drill—Foote-Burt #25—24" Hi Duty. 3" capacity in steel, motor attached.

PATTERN MAKING MACHINERY—12"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. BOX 88, COLUMBUS 16, OHIO

LATEST TYPE NEARLY NEW MACHINES

IMMEDIATE SHIPMENT **LATEST TYPE**



MATTISON—14x16x60" High Powered Precision Surface Grinder—Hydraulic

Equipped with guards, pumps, tank, piping, diamond holders. Arranged for motor drive with motors and electrical starting equipment.

BORING MILLS—Horizontal

DETRICK & HARVEY 4", 5" bar, Floor Type
GIDDINGS & LEWIS #32—3¼" bar, latest type
LANDIS #35 3½" bar, Floor Type
LUCAS #31, 3" bar, latest type, motor drive
NILES BEMENT POND 4½" bar, Motor Drive
NILES BEMENT POND 5", 6", 7" bar, floor type
UNIVERSAL 3" bar, latest type

BORING MILLS—Vertical

BETTS 120", 2 swivel heads, AC, M.D.
BETTS (Consolidated) 84"—3 heads, AC, Latest
BULLARD 16"—6 spindle Mult-Au-Matic—Type D—Single indexing—Latest Type
BULLARD 24", 36" Ver. Turret, spiral drive, latest type
BULLARD 54" Maximill, 2 swivel hds., M.D.
KING 36" Vertical Turret, M.D., Latest Type
NILES 62", 73", 100", swivel heads—PRT, Motor Drive

BROACHES

LaPOINTE 4L, Horiz., hyd., latest type
LaPOINTE #SRV-25-66, 10-54, Vertical Surface, hyd., latest type

DRILLS

BAUSH #3, #4 Adj. multiple spindle, M.D.
CARLTON 6'15" Ball Bearing, Radial—M.D.
FOSDICK 6' arm 19" column "Economax", Hydraulic Radial, latest type
NATCO D5, D6, adj., mult. spdle, latest type
NATCO 4BL adj., mult. spdle, latest type
WESTERN 5'18", 6'20" Radial—Latest Type

GEAR CUTTING EQUIPMENT

BARBER & COLMAN #3 hobber, latest type
BROWN & SHARPE No. 3H gear cutter, M.D.
FELLOWS 61, 615A, 645A3, 7, 7A, 72, 75A, 77, High Speed Gear Shapers, latest type
GLEASON 11", 18" bevel generator M.D.
GLEASON 12" Straight Bevel Generator, Latest Type
GOULD & EBERHARDT 12H, 24H, 36H, 48H Hobbers, latest type
GOULD & EBERHARDT 12HS Hobber, latest
PRATT & WHITNEY 10" Grinder, hyd., latest
SCHUHARDT & SCHUTTE #1, #2 with diff., M.D.

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 3x12, Latest Type
BROWN & SHARPE #20, 10x18 plain, latest type
CINCINNATI 6x18 plain Model EA, latest type
LANDIS 4x18, Type H, hyd., latest type
LANDIS 6x18 Type "C", hyd., latest type
LANDIS 30x220" Plain, Roll, Motor Drive
NORTON 10x18 Type C, hyd., latest type
NORTON 16x72" Univ., Hyd., Type C, latest
NORTON 16x72" Plain Type "C", latest type

GRINDERS—Surface

ARTER 30" Rotary Surface—Hyd.—latest type
BLANCHARD #11—16" chuck, Latest Type
BLANCHARD #16—24" chuck, Motor Drive
BLANCHARD No. 16A—Dial Type—motor drive
BLANCHARD #18—30" chuck, latest type
BLANCHARD #27—18 M.D., Latest Type
GALLMEYER & LIVINGSTON #35, 8x24" Hyd., latest
GALLMEYER & LIVINGSTON #55, 12x36" hyd., latest
HEALD 25A Rotary, 16" chuck, latest
HEALD #22, 12" chuck, Rotary, latest type
MATTISON 12x16x60 Hydraulic, latest
NORTON 10x36 Hyd., Latest Type
NORTON 6"x18"—Hyd.—Latest Type
THOMPSON 8x12x24 Hyd., latest type
THOMPSON 16x30x48 Hyd., Latest Type

JIG BORER

PRATT & WHITNEY 3B, Motor Drive, latest

LATHES—Engine and Mfg.

BETTS BRIDGEFORD 60"x24' bed, swing 84"
BRIDGEFORD 36"x28', 36"x32' bed—2 car., M.D.
HENDEY 14"x34" centers, geared, engine, M.D.
HENDEY 12"x30" centers, TIMKEN, latest type
JONES & LAMSON "Fay" 20x25" automatic, TIMKEN, latest type
LEBLOND 13"x4', 17"x5', 17"x10' bed, Rapid Production, Timken Bearing, latest type
LEHMAN 16"x30" centers, hydratrol, TIMKEN, latest type
LODGE & SHIPLEY 16/20"x30" centers, Timken bearing, latest type
LOSWING 4x60, 4x84, 8x60, 8x108, 5x34" centers, latest type
MONARCH 10x20" centers Model EE, Timken, latest
MONARCH 36x108" Centers, Timken, latest type
MONARCH 12"x30" centers, Timken, Latest type
MONARCH 16"x28" centers, geared, M.D.
NILES 42"x60", double head, motor drive
NILES 48x35' centers, Heavy Duty, 2 carriage, Timken Bearing, PRT, Latest Type
NILES 60x10', 35', centers, 1 or 2 carriages, Timken Bearing, PRT, Latest Type
NILES 72"x62' centers, combination Boring and Turning, Motor Drive
NILES 30x50' Boring, Timken, Latest Type
REED PRENTICE 16x24" centers, geared, M.D.
SPRINGFIELD 14"x42" centers, geared, MD
SPRINGFIELD 16"x24" centers, geared, MD
SUNDSTRAND 8x15", 12x22" stub, automatic, TIMKEN, latest type
WARD HAGGAS & SMITH 18/36"x10' bed, Gap

LATHES—Turret

CINCINNATI ACME No. 1, No. 5W, Latest Type
GISHOLT #3, 5, Univ., Timken, Latest Type
GISHOLT #1L, #2L Universal, Timken, Latest
JONES & LAMSON #3, 7C, 8A, Universal, Timken Bearing, Latest Type
LIBBY 1H-5, 5½ hole, Timken, Latest
MOREY No. 2G, No. 3, No. 4, Timken, latest
POTTER & JOHNSTON #5D2E, 5DE, TIMKEN latest type
WARNER & SWASEY 3A, Universal 6" bar capacity, Timken Bearing, Latest Type
WARNER & SWASEY #5, Univ., Timken
WARNER & SWASEY #1A, 4A, Univ., Latest

MILLING MACHINES—Mfg.

CINCINNATI, 24", 48" duplex, TIMKEN, M.D.
CINCINNATI 3-24 Duplex Hydromatic, latest type
INGERSOLL 32x24x16' Planer Type, 2 heads, AC, M.D.
TAYLOR & FENN M-80 Duplex, Spline, latest type

MILLING MACHINES—Plain

BROWN & SHARPE #12 Timken Bearing, latest
BROWN & SHARPE #3B, Timken Bearing
CINCINNATI 1-12, 2-24 Timken, latest type
CINCINNATI 436 Hydromatic, latest type
CINCINNATI #2, #4 Dial Type, Timken, latest
CINCINNATI #4, 4S, 5, Timken Bearing, M.D.
CINCINNATI 08 Automatic rise and fall, Timken, Latest Type
KEARNEY & TRECKER #4 heavy, TIMKEN, latest
KEARNEY & TRECKER 1218, 1224 Simplex, Timken bearing, latest type
KEMPSMITH #2, #4, Timken, latest type

MILLING MACHINES—Vertical

CINCINNATI #2, 3, 4, Dial Type, Timken, latest type
CINCINNATI No. 3, No. 4 High-Powered, M.D.
GORTON #8D superspeed, latest type
GORTON #9J superspeed, complete with duplicator, latest type
REED & PRENTICE 3VG with Hydraulic Duplicator Timken Bearing, latest type
REED PRENTICE #5 die sinker, TIMKEN, latest

PLANERS

CHANDLER 36x36x20', 4 heads, AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
DETRICK & HARVEY 84x84x18', 4 heads, DC, M.D.
NILES BEMENT POND 48x48x16', 2 heads, AC, M.D.
OHIO 42x42x20'—2 heads, AC, M.D.

SHAPERS

LAMAIRE 18' Vert. Hydraulic—latest type
LYND FARQUHAR 26" Openside, Motor Drive
MOREY 8", 10", 12", 14" Vertical, latest type
MORTON 48" Draw Cut, Motor Drive
PRATT & WHITNEY 6'10" Vertical, M.D.

MISCELLANEOUS

BARNES #172, 306H Vertical Hone, Latest
BIRDSBORO 350 ton vertical hyd. pres, latest type
FERRACUTE DG-55, 75 ton Drawing Press, Tie Rod, 17" stroke, Latest Type
LANDIS 1" Bolt Threader—Latest Type
MORTON 60" traveling head, planer, miller and driller
PRATT & WHITNEY "Keller" Type G, Type BL2416—Latest Type
JONES & LAMSON 6x15", 8x18" thread grinders, Latest type

Available for Prompt Shipment • Most Built After 1941

(Partial List) Over 2,000 Machine Tools in Stock. Your Inquiries Are Invited . . . Prompt Service Is Assured

MOREY MACHINERY CO., INC.

410 BROOME ST., NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-5360
CABLE ADDRESS: WOODWORK, N. Y.

QUALITY *Machine Tools*

NOW IN STOCK

28" x 60" Cincinnati Hydrotel Vertical Milling Machine, single spindle model with 360° profiling attachment, motors and controls. New in 1941.

AUTOMATICS

9/16" RA-6 Acme-Gridley. New in 1943.
1" RA-6 Acme-Gridley. New in 1943.
1¼" R-6 Acme Gridley.
1⅝"—8 spindle Conomatic. New in 1942.
5½" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe. New '41.
★ **Bullard Multaumatic, six spindle model D, single index. Late model.**

BROACHES

No. 2SL LaPointe Hydraulic Horiz. 1942.
No. CPC 8-24 LaPointe Hyd. vert. 1943.
No. CPC 6-36 LaPointe Hyd. vert. 1943.

DRILLS

6 Ft. American radial 17" column.
4'-9" Cincinnati-Bickford Radial. New in 1945.
★ **No. 26HO Baker Hydraulic, S. S., 3" capacity in steel, with motor & control.**
42" Cincinnati-Bickford, single spindle.
No. 3 Avey, three spindle, heavy duty.
No. 3 Baush Multiple Spindle.
Barnes Horiz. Deep Hole, two spindle.
Taft Peirce Horizontal, double end.

GEAR CUTTERS

No. 16H Gould & Eberhardt Universal Hobber. Latest type.
No. 7A, 7125A Fellows Gear Shapers.
No. 615A, 645A, Fellows Gear Shapers.
No. 3, 12 Barber Colman Hobbers.

GRINDERS

No. 2 & No. 3 Cincinnati Centerless, Filmatic spindle. New in 1941.
14" x 48" Cinci. Plain, Filmatic spindle.
10" x 36" Landis Hydraulic. New '43.
6" x 18" Cinci. Hyd., Filmatic spndl. 1943.
No. 3 Brown & Sharpe Universal. 1943.
No. 13 Brown & Sharpe Univ. and Tool.
No. 2 Norton Universal Tool.
No. 18 Blanchard, 30" chuck. New 1942.
14" x 16" x 60" Mattison Surface.
No. 75A Heald Internal. New in 1943.
No. 72-A-3 Heald Sizematic. New in 1943.
No. 16-16 Bryant Internal, Hydraulic. Used less than 2 years.

LATHES, ENGINE

Monarch Toolmakers 10" x 20" Model EE.
Lodge & Shipley 20" x 48". New in 1943.
★ **Bertram 28" x 240" "Timesaver", two carriages, rapid traverse. Canadian made from Niles patterns. New in 1942.**
Lodge & Shipley 48" x 54", cone driven.
Carroll Jamieson 18" x 5', C.D.
LO-Swing, IMP & LR.
South Bend 14½" x 6', c.d.
Lipe Carbomatic, 15" x 30".
LeBlonde Production, 17" x 30".

LATHES, TURRET

Warner & Swasey No. 2A, preselector. New in 1943.
Warner & Swasey No. 1A, preselector. New in 1940.
Gisholt No. 1L, Hyd. speed selector. 1943.
Warner & Swasey No. 5 Universal. 1943.
Gisholt No. 5 Universal, Hydraulic speed selector. New in 1944.
Foster No. 5 Universal, Bar feed. 1943.
Warner & Swasey No. 4 Universal, preselector. New in 1943.
Gisholt No. 4 Universal, Hydraulic speed selector.
Warner & Swasey No. 3 Universal, two speed. New in 1942.
Bardons & Oliver No. 3 Universal, motor in base. New in 1941.
Warner & Swasey No. 2, oversize. 1942.
Bardons & Oliver No. 2, bar feed. 1941.
Brown & Sharpe No. 1, m. in base, 1941.
★ **Bullard New Era VTL, 36" x 42".**

MILLS

Van Norman No. 2SU Universal.
Gorton No. DJ Vertical, with tracer.
Cincinnati No. 2MH Plain, latest model.
Cincinnati Vertical, No. 3, Med. S. Dial.
Milwaukee Vertical, No. 2H. New in 1942.
★ **72 Betts Vertical Boring Mill, two heads, DC driver with AC/DC generator. New in 1943.**

MISCELLANEOUS

No. 5B Standard OBI Press. New.
No. 7 Kling Punch, 1¼" through 1", 72" throat.
No. 8-6 Zeh & Hahneman S.S. Geared Press.
Pratt & Whitney Profiler, No. 12D.
25" Gleason Quenching Press.
24" Cincinnati Worm Feed Rotary Table.

PLANERS AND SHAPERS

Cincinnati Planer, 42 x 42 x 20, D.C.
Cincinnati 24" Shaper, Univ. table. 1945.
American 24" Shaper.
Gould & Eberhardt 24" Shaper.
Cochrane & Bly No. 14 Vertical Shaper.
Pratt & Whitney 6" Vertical Shaper.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSE

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
1961 S. Meridian St., Indianapolis 6, Indiana
EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK
MEXICO OFFICE: HIDALGO ORIENTE 2-535-B, MEXICO, D.F.

Bor, Mill Hor. 3" G & L, M.D.
Boring Mills, 24"-36"-42"-52"-72"-96"
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
Lathe, Turret 3-A W. & S., S.P.D.
Millers, Plain No. 3 K & T, No. 4 Cin.
Millers, Vertical No. 3 B & S & No. 4 Cin.
Profiler, #13 P. & W., B.D.
Shapers, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

POWER PRESSES

BLISS, TOLEDO, V & O ETC.
REBUILT – GUARANTEED
MONA MOTORS

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

POWER PRESS BRAKES

Cincinnati 375 ton, 8'8" die surface, 6'6" by ⅝" cap. New 1942.

Clearing #90-10, 12' overall, 10' bet. housings, 10 gauge. New 1942.

ALSO

Pratt & Whitney #2A Jig Borer #3644 with equipt. New 1945—Barely used.

AARON MACHINERY CO., INC.
45 CROSBY STREET, N. Y. C.
Tel. Digby 9-1766

LATE TYPE TOOLS

36" Bullard Spiral Drive, 1943 tool
No. 2MH Cinci. Univ. Miller, 1944
No. 2H K. & T. Univ. Miller, 1944, slotting & vert. attach. & rotary table.
Nos. 2, 3, 4, & 5 W. & S. Univ. Turrets, late
22"x96" centers Monarch, new 1944
36"x23' centers, 42"x17' centers, 48"x16' centers, & 60"x15' centers Niles Lathes, all new 1942
28/30"x14' Rahn-Larmon Gap Lathe, T. A.
No. 48H Gould & Eberhardt Gear Hobbers, 1941
12" Gleason Gear Generators, 1943 (3)
6' Fosdick Radial, 19" col., 1943.

BENNETT MACHINERY CO.
30 Church St. N. Y. 7, N. Y.

MILES' QUALITY

Automatic, 2⅝" Acme Gridley RA6
Automatic, 12"x63", 14"x19" & 16"x33" Fay
Broach, Twin 10 & 3XA Oilgear
Broach, 2S, 3H LaPointe
Drill, 3'9" & 4'9" Cint. Bick. radial
Drill, 21" & 24" Cint. Bick. upright
Drill, Nos. 11, 14 & 30 Natco multiple
Drill, Nos. 121, 217, 314, 315, 321 Baker
Drill, 24", No. 3 Aveymatic 2 spindle
Gear Hobber, Nos. 3, 12 & Type D Barber Colman
Gear Hobber, Nos. 16HS, 12H & 8H G. & E.
Gear Hobber, No. 5M Adams Mfg.
Gear Hobber, No. 130 Cleveland
Gear Hobber, Nos. 1 & 5AC Lees-Bradner
Gear Shaper, Nos. 7 & 61 Fellows
Grinder, Centerless, Nos. 2 & 3 Cincinnati
Grinder, 6"x18" No. 10 Brown & Sharpe
Grinder, 10"x18" Cincinnati
Grinder, 6"x18", 10"x18" & 16"x36" Landis
Grinder, 6"x18" & 10"x72" Norton
Grinder, 12"x36", No. 2 B. & S. univ.
Grinder, No. 115 Gardner opposed disc
Grinder, Disc, No. 226 Gardner
Grinder, Surface, 10"x24" Norton hydraulic
Grinder, Surface, 12"x48" Thompson hydraulic
Grinder, Surface, 14"x60" Mattison hydraulic
Grinder, Surface, 12", 16" & 24" Heald rotary
Grinder, Surface, Nos. 10 & 16 Blanchard rotary
Lathe, 14"x8' Hendey toolroom
Lathe, 22"x96" Monarch
Lathe, 25"x48" LeBlond
Lathe, 36"x16' bed Bridgeford
Lathe, Turret, Nos. 2, 3, 4, 5 & 1A & 3A Warner & Swasey
Lathe, Turret, No. 3, 4, 5 & 1L Gisholt
Lathe, Turret, No. 2 Cint. Acme saddle type
Lathe, Turret, No. 601 Oster
Lathe, Turret, No. 5 Foster
Lathe, Turret, No. 5 Bardons & Oliver
Lathe, Turret, Nos. 2G & 3 Morey
Lathe, Turret, 24", 36" Bullard vertical
Lathe, Mfg., 14"x18" Monarch Magnamatic
Lathe, Mfg., 6", 8", & 15" Sundstrand auto. stub
Lathe, Mfg., Mod. 10x40" Sundstrand center drive
Mill, 3⅛", No. 0 Giddings & Lewis
Mill, 3½" bar Universal
Mill, 4¾" bar Giddings & Lewis floor type
Mill, 7" Barrett cylinder boring
Mill, Vertical, 53" & 100" Niles-Bement-Pond
Mill, Vertical, 96" Cincinnati
Millers, Nos. 2AS, 3B & 4B Milwaukee plain
Miller, No. 3 Cincinnati universal
Miller, No. 3 Van Norman duplex
Miller, Nos. 3 & 4 Cincinnati dial type
Miller, Nos. 2M, 2, 3, 4 & 4HD Cincinnati vertical
Miller, No. 2H, 3H & 4H Kearney & Trecker vertical
Miller, Nos. 2-24, 3-24, 4-36, 4-48, 5-48, Cincinnati Hydromatic
Miller, No. 33 Sundstrand, 18"x120" table planer type 2 vertical spindles
Miller, No. 12-24" Brown & Sharpe Mfg.
Miller, 30" & 66" Newton rotary
Miller, 30", 42" & 84" Ingersoll rotary
Miller, Nos. 4 & CT36 Lees-Bradner thread
Miller, No. 3 Planomill thread
Planer, 33"x33"x8' Cincinnati
Planer, 48"x48"x12' Cincinnati
Press, Nos. 10, 73½ & 304 Bliss S.S.
Press, Nos. 56 & 56½ Toledo S.S.
Press, 70 ton Verson, cushion
Press, 1000 ton No. 666 Toledo coining
Press, 100 & 200 ton Hydraulic
Roll, No. 18 Kane & Roach straightening
Saw, No. 302 Campbell abrasive
Saw, 42" Tannewitz metal band
Shaper, 6" Pratt & Whitney vert.
Shaper, 12" Whipp
Shaper, 16", 20" & 28" Gould & Eberhardt
Shaper, 20" & 24" Gemco universal
Shaper, 36" Rockford shaper planer
Tapper, No. 1 Bakewell
Tapper, Nos. 2 & 2X Garvin
Upsetter, 1" National High Duty
Upsetter, 1½" Acme

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Eastern OFFERS FROM STOCK

DEVOTED EXCLUSIVELY TO REBUILT MACHINERY

TURRET LATHES AND SCREW MACHINES

No. 1 Cincinnati Acme Semi-Universal, m.d., bar, Timken, late
No. 1 Cincinnati Acme Semi-Universal, m.d., chucking
No. 1L Gisholt Universal, m.d., chucking, Timken, late
No. 1A Warner & Swasey Universal, m.d., chucking
No. 1A Warner & Swasey Universal, m.d., bar
No. 1A Warner & Swasey Universal, m.d., chucking, pre-selector, latest type
No. 2 Cincinnati Acme Full Universal, m.d., chucking, latest
No. 2L Gisholt Universal, m.d., chucking, long bed type, late
No. 2 Pratt & Whitney Shaver, m.d., collets
No. 2 Warner & Swasey All Geared Head, m.d., bar, latest
No. 2A Warner & Swasey Universal, m.d., chucking, Timken
No. 2A Warner & Swasey Universal, m.d., bar
No. 2B Foster Universal, m.d., chucking
No. 2G Morey Ram Type, m.d., bar
No. 3 Cincinnati Acme Full Universal, m.d., chucking
No. 3 Foster Geared Head, m.d., auto. chuck
No. 3B Foster Universal, m.d., bar
No. 3L Gisholt, chucking, Timken, m.d.
No. 3L Gisholt, chucking, cross sliding turret, m.d.
No. 3 Warner & Swasey Universal, m.d., bar, latest type
No. 3 Warner & Swasey Universal, m.d., chucking, latest type
No. 3A Warner & Swasey Universal, m.d., chucking, Timken, latest type
No. 3A Warner & Swasey Universal, m.d., bar
No. 3A Warner & Swasey Universal, m.d., chucking
No. 4 Gisholt Universal, m.d., chucking, Timken, late
No. 4 Warner & Swasey Universal Gear Head, m.d., chucking
No. 4 Warner & Swasey Universal, m.d., chucking, pre-selector, latest type
No. 4 Warner & Swasey Universal, m.d., bar, pre-selector, latest type
No. 4 Warner & Swasey Plain, bar, cone
No. 4 Warner & Swasey Universal, bar, cone
No. 4 Warner & Swasey Plain, chucking, cone
No. 4A Warner & Swasey Universal, 8" hole in spindle, chucking, latest
No. 4A Warner & Swasey Universal, 7½" hole in spindle, chucking, Timken
No. 4R Cincinnati Acme, m.d., bar
No. 5 Foster All Geared Universal, m.d., chucking
No. 5 Jones & Lamson Universal Ram Type, m.d., chucking, latest
No. 5 Warner & Swasey Universal, m.d., chucking, Timken
No. 5 Warner & Swasey Universal, m.d., chucking, preselector, latest
No. 7 Bardons & Oliver Universal, m.d., chucking, late
1x7" Cincinnati Acme, cone, bar
2½" Jones & Lamson Universal Saddle Type, m.d., bar, Timken, late
2½"x24", 3x36", 3½x32", 4x34" Jones & Lamson Geared Head, m.d., bar and chucking types
2 spindle 3x36" Jones & Lamson Geared Head, m.d., chucking
3¼" Cincinnati Acme Geared Head Flat Turret, m.d., chucking
18" and 26" Libby Geared Head, m.d., chucking
20" Acme Plain, cone, chucking
24" and 28" Gisholt, cone, chucking
No. 5 Woods Tilted Turret Model D, cone

AUTOMATICS

4 spindle ⅞" Cleveland Model M, m.d.
4 spindle 2" Cleveland Model M, m.d.
4 spindle 2¼" Cleveland Model K, m.d.
2¼" Cleveland Model A, m.d.
2¼" Gridley, m.d.
2½" Cleveland Model A, m.d.
4¼" Cleveland Model A, m.d.
4½" Cleveland Model A, m.d.
5½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
7¾" Cleveland Model A, m.d.
No. 4D Potter & Johnston, m.d.
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay, Flanders Type, m.d.
20x25" Jones & Lamson, m.d., latest

HORIZONTAL BORING MILLS

6" bar Sellers Floor Type, with 2" additional high speed spindle, m.d., has floor plate 144x180", new 1943
3½" Cincinnati Gilbert Floor Type, m.d., with floor plate 8x10', latest type, new 1943
2½" bar Cleveland, m.d.
No. 31 Lucas, m.d., 3" bar
No. 32 Lucas, m.d., 3½" bar
No. 33 Lucas, m.d., 4½" bar
4" bar Detrick & Harvey Floor Type, m.d.
4" Niles Table Type, old
5½" Niles Table Type, m.d.
10" bar Sellers Floor Type, m.d.
Morton 60" stroke Boring Mill and Traveling Head Planer, m.d.

BROACHING MACHINES

Oil Gear Hydraulic type XA, 64" stroke, 20 tons
Colonial VAS-5-42 Single Ram Hydraulic, m.d., latest
Cincinnati Mill Broach, 10" spindle, m.d., new
No. 75 HP LaPointe Horizontal Hydraulic, 150" stroke, 37½ tons cap., latest
No. 4 LaPointe of Hudson, gear box

RADIAL DRILLS

3' American Sensitive, belt
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, m.d., 13" col.
5' Cincinnati-Bickford Full Universal, 13" col., gear box
5' Cincinnati-Bickford Plain, 13" column, m.d. on base
5' Cincinnati-Bickford Plate Hole Driller, m.d.
5' Prentice, m.d. on base
6'-15" Carlton, gear box on base
6' Cincinnati-Bickford, d.c. motor on base
6' Niles-Bement-Pond Semi-Universal, m.d.
6'-16" Western, m.d.
8'-16" American Triple Purpose, m.d. on arm
8'-19" American Triple Purpose, m.d. on arm, 1942 machine
10'-22" American Triple Purpose, m.d. on arm

HORIZONTAL DRILLS

No. 1B—50" Pratt & Whitney Deep Hole, m.d., latest
No. 1 Pratt & Whitney 2 spindle Deep Hole, belted m.d.
No. 1½x105" Pratt & Whitney 2 spindle Deep Hole, m.d., latest type
No. 1½ Pratt & Whitney 2 spindle Deep Hole, belted m.d.
Pratt & Whitney Rifling Machine, belt
5 spindle Detroit Semi-Automatic, belt

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x30" head, 15 spindles
No. 16 Fixed Center Foote-Burt, m.d.
3 spindle 12" Rockford Gang, m.d.
4 spindle 21" Cincinnati-Bickford Gang, m.d.
4 spindle Foote-Burt Rail, m.d.
D13H Natco, head 18x12".

GEAR SHAPERS

No. 6 Fellows, belt
No. 7 Fellows, m.d.
No. 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61 Fellows, belted m.d.
No. 61A Fellows, m.d., latest type
No. 64-S Fellows, m.d.
No. 615A Fellows, m.d., latest
No. 645A3 Fellows, m.d., latest
No. 71A Fellows, m.d.

GEAR GRINDING MACHINES

No. 13LS Fellows Lapper, m.d.
9" Pratt & Whitney Hydraulic Spur Gear, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical, m.d.
No. 2HS Lees-Bradner Spur & Helical, m.d.

GEAR HOBBERS

Type A Barber-Colman, m.d., latest
No. 12 Barber-Colman Double Overarm, m.d. long bed type
Barber-Colman Type T, m.d. latest
No. 34 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe, m.d.
48" Cleveland Hobber, m.d.

GEAR CUTTERS

Cross Gear Tooth Rounder, m.d.
Gleason Testing Machine, m.d.
3" Gleason Straight Bevel Gear Generator, m.d.
3 spindle Gould & Eberhardt No. 36BM Vertical Gear Rougher, s.p.d.
No. 3—26" Brown & Sharpe Auto. Gear Cutter, m.d.
No. 6—60" Brown & Sharpe
No. 1 Brown & Sharpe Gear Tester
8" Gleason Mfg. Type Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d., Filmatic Spindle, latest
No. 2 Cincinati, m.d., older types
Cincinnati Valve Seat Grinder, m.d., cap. ⅜" valve stems

INTERNAL GRINDERS

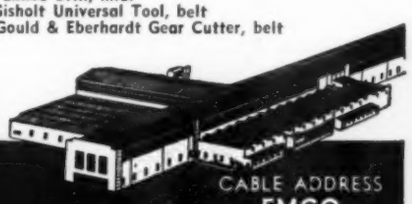
No. 16A—16" Bryant, m.d., late
No. 16—22" Bryant, m.d., latest
No. 16RS Bryant, m.d., latest
No. 6, 10, 20 Bryant, belt
No. 24—21" Bryant, m.d., late
No. 49 Heald Single End Borematic, m.d.
No. 70 Heald, belted m.d.
No. 72A Heald Plain, 3 motor drive
No. 72A3 Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, 2 motor drive
No. 72A3 Heald Sizematic, 3 motor drive
No. 72A5 Heald Plain, m.d.
No. 72A5 Heald, long bed type, 3 motor drive, latest
No. 72A5 Heald Sizematic, 3 motor drive
No. 73 Heald Airplane Cylinder, 4 m.d. brand new
No. 74 Heald, m.d., late
No. 172 Heald Gap Grinder, m.d., brand new

SURFACE GRINDERS

No. 5 Brown & Sharpe Hydraulic, m.d., latest
No. 33 Abrasive Vertical, m.d.
Builders Iron Foundry Co. Surface, m.d.
10x24" Norton Hydraulic Surface, m.d., latest
14" Pratt & Whitney Vertical, m.d.
16" Arter A3 Rotary, m.d., latest, new
22" Pratt & Whitney Vertical Type B, m.d.
30"x18"x6' Springfield Planer Type, m.d.
No. 10 Blanchard Vertical, 16" chuck, m.d.
No. 11 Blanchard Vertical, 16" chuck, m.d., latest
No. 16 Blanchard Vertical, 26" chuck, m.d.
No. 18 Blanchard, m.d., 30" chuck, latest
No. 22—12" Heald Rotary, m.d.
No. 25A—16" Heald Rotary, m.d., latest
No. 25-A—24" Heald Rotary, m.d., latest
No. 260—16" Heald Rotary, belt
54" Bridgeport Knife, belt

TOOL & CUTTER GRINDERS

No. 2 LeBlond, m.d., latest
No. 12M Grand Rapids Tap, m.d.
Cincinnati Monoset, m.d.
No. 2 Ohio, belt
Type 05D Sellers Bench Drill, m.d.
No. 3 Gallmeyer & Livingston Tool, m.d.
No. 4T Sellers Tool, m.d., latest
Gleason Cutter, belt
Yankee Drill, m.d.
Gisholt Universal Tool, belt
Gould & Eberhardt Gear Cutter, belt



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Modern Machine Tools Immense Stock..... Ready to Ship

DRILLS
Avey & Allen 3, 4, 5, & 6 Sp.
Cincinnati-Bickford 3', 4', 5', & 6' Radials
Carlton 4' Radial
Niles-Bement-Pond 6' Radial

GRINDERS
Abrasive Nos. 33 & 34; No. 3B
Norton 6"x18" Hyd. Surface
Norton 6"x10"x36" Surface
Norton 15"x15"x72" Surface
Hill-Acme 18"x24"x96" Surface
Mattison 12"x16"x54" Surface
B. & S. Nos. 1, 2, 3, Universal
B. & S. Nos. 5, 10, 11, Plain; #13
Bryant Nos. 3B, 5, 6, 12 Internal
Cincinnati No. 1½ Tool & Cutter
Norton No. 2 Tool & Cutter
Cincinnati No. 2 & No. 3 Centerless
Cincinnati No. 3 Centerless Lapper
Fitchburg 36" Spline Grinder
Blanchard No. 16—30"
Heald No. 25-A Rotary Surface
Heald Nos. 70A & 72A Internal
P. & W. 14" Vert. B.B.; also 22".
Gardner No 5 Disc

LATHES
Monarch 12"x30" CK (swings 18")
Hendey 14"x6' Y.H. Fact. M.D.
American 16"x6'—G.H.
Monarch 16"x8'—G.H.
Fitchburg 60"x22'
Midland No. 4 Turret
Gisholt No. 3L and No. 5
Bardons & Oliver No. 5 Turret

MILLERS
Milw. #2B Universal
Cin. #2 Universal
K & T #2HL & #4H Plain
Milw. No. 2B & 3B Double Overarm
B. & S. No. OY Production
Cin. Nos. 3, 4 Vert.
Becker Model C Vertical
B. & S. No. 3B & 5B Plain
Kempsmith #2G Plain
Van Norman Duplex #0, #2, #10, #20
Rice Burton 4" Spline
P. & W. 8", 10", & 12" Automatic
Cincinnati 18" & 24" Production
Sundstrand No 1 18 and No. 2 Electromil
P. & W. 6x14 Thread
Lees-Bradner 6"x36" Thread
Cincinnati #5 M.D. Plain
Cincinnati No. 3 Plain, Late
K&T #2K, 3K Vertical
Gorton No. 9J Vertical
Bridgeport Vertical

PRESSES
1000 ton Toledo Knuckle Joint
WF 3000 ton Hydraulic
WF 157 Ton Vertical Hydraulic

SCREW MACHINES
B. & S. No. 00, 0, 2 Automatic
B. & S. No. 1 & 2 Hand Screw
Cleveland 1⅜" Model AA
W. & S. Nos. 1, 2, 2A, 3A Universal
Foster No. 7 and No. 1B
Cone 1¼" 4 Spindle
Cleveland 3¼" Model A, Latest Type
Cone 3½"—4 Spindle
Cleveland 6¾" Model A
Cleveland 7¾" & 8" Model A
Gridley ⅞", 1¼", 1¾", & 2⅝", Model G; 3¼" & 4¼"
Cleveland 2½", Model K
New Britain Gridley Model 60

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National Bent Shank Nut Tappers—Battery of ⅝" and ⅞" Machines.
2 Landis ¾" Bolt Formers and Threaders, M.D.
1 National ½" to 1" Hot Bolt Head Trimmer
Woodward & Powell 42"x42"x36 ft. 4 Head Planer
Cincinnati 36"x36"x16 ft. Planer, M.D.
1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

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3'-11" American Hole Wizard Radial
#12 Landis Centerless Grinder
16"x24"x72" Mattison Surface Grinder
6"x18" Norton "C" Hydraulic Grinder
6"x30" Norton "C" Hydraulic Grinder
#1248 Kearney & Trecker SIMPLEX Miller
#3HS Cincinnati Vertical Miller
#2—#3—#4—#5 Warner & Swasey Universal Turret Lathes
#1 Brown & Sharpe Wire Feed Hand Screw Machines

ALL LATEST TYPE MACHINES

HAZARD BROWNELL
350 Waterman St., Providence 6, R.I.

MACHINE TOOLS

Specials
P & W #2A Jig Borer, New 1945
Cincinnati 375 Ton Press Brake—8'8" die surface—6'6"x⅝" cap.—1942
Clearing 90-10 Press Brake—10' 10 Ga.
Fosdick 24" Sliding Head, Box, Late
56 Ton Thomas OBI Press, New 1947
Gorton Duplicators and Vert. Millers
Gorton No. 3Z, 1D, ME Engravers
B. & S. No. 2 Vert., Swivel Head
Norton, Doall Surface Grinders 8"x24"
Marvel 6A Hacksaw, M.D., Auto. Feed
Injection Moulders, Hydraulic Presses

BORING MILLS
#0 Giddings & Lewis arr. M.D.
2½" Cleveland arr. M.D., 2½", 4" Binsee
Niles-Bement-Pond 4" duplex, Universal 3"
66" Niles; 54" Colburn M.D. 2 hds.
Bullard New Era 24", 42", Vert. M.D.

TURRET LATHES
W. & S. Nos. 3, 4 Grd. Hd., Preselector
Gisholt No. 1L, 2L Univ. M.D.
Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36"
Acme #2 M.D.

GRINDERS
Abrasive 3B 8"x24" Surf., #34 Vert.
#25 Gallmeyer & Livingston Hyd. Surface
#25A Heald, M.D. like new Rotary Surf.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 2, 2B Surface, M.D.
P. & W. 14", B.B., Vert. Surface 19"x49"
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald No. 72A3 Gagematic
Norton 50"x28', M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D.
No. 55, 60, 65 Heald int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10, 11 Cyl.; 1, 3 Univ.
Norton 6x18" 8x24" Hyd. Surface, M.D.
Covel #91A Tool, New 1941, Norton, Cinn.

LATHES
26x15' Springfield Grd. Hd., late
Monarch Hendey 12x30, 10x20 G.H. Late
26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey, Taper, Collets 16"x8'
9" LeBlond P&W 1"x18" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D.
20"x30' Boye & Emmes Grd. Hd.
South Bend, M.D., T.A., 16"x10', 9"x3'
Sundstrand Centering Machine #56

AUTOMATICS
Cleveland Model A ⅞", 1¼", 2"; B 1", 2" ⅞" Cone 4 spindle, Gridley
Brown & Sharpe 0G. New 1941. #2 Hand

New in Stock
Power Shears—52", 72" & 96"
Spot & Arc Welders
5, 7, 14, 18 & 30 ton OBI Power Presses
Ammco 7", Shape Rite 8" Shapers
H.S. Vertical Milling Heads
Drill Presses, Foot Presses
Kalamazoo Metal Band Saws
No. 1½ Abrasive Surface Grinder
6x6" Racine Hacksaw; #8 Marvel
20 ton Northern Hydraulic Presses

RADIALS
4' Fosdick 13" col., 8' Carlton, 19" col. M.D.
6' Cincinnati-Bickford
4', 5', 6' American Triple Purpose
Canedy-Otto 3'11" Col., M.T. on Spindle

MILLING MACHINES
Cinn. #3 Pl., #4 Vert. Dial Type, Rect.
#3 K. & T. Dbl. overarm, motor in base
Cleveland Vert. No. 1 M.D.; #1 Univ.
#12 Van Norman, Duplex
#2B K & T Univ.; No. 2A B & S Univ.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 2, 3, 4 Cincinnati Vert.
P. & W. No. 12, 30" Profiler, M.D.
B. & S. No. 1, 3, Vert.
B. & S. #12 Elec. Prod. late type, #21

MISCELLANEOUS
Mitts & Merrill, Davis Keyseaters
Wiedman Turret Punch—Type R4P
Buffalo #0 Angle Roll MD.
#20 Bliss OBI, #58-OB Gap Presses
6" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Pexto 6' Power Shears
Burke & Nichols Millers, Pl. & Univ.
Delta Single & Multiple Drills
Deckel G1, G2, G1F Engraving machines
Landis Dbl. Head Bolt Threader, 2½"

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LATHES
30"x12' Boye Emmes G H
30"x18' American G H
36"x28' Lodge & Shipley
60"x15' centers Niles G H
100"x32' Niles Extra Heavy

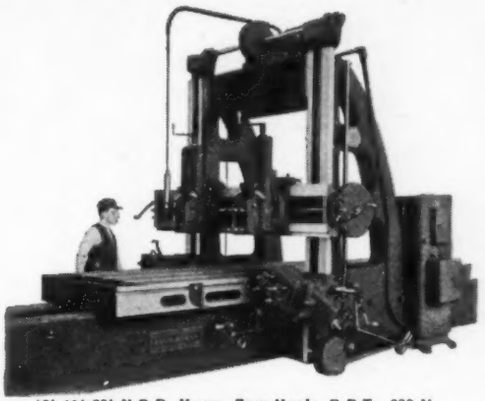
RADIAL DRILLS
3½' Cincinnati Bickford
4' Carlton, motor on arm
6' American, Triple Purpose
7' Carlton, motor on arm
8' American, motor on arm

MILLERS
No. 5 Cincinnati Plain
No. 3B Milwaukee Plain
1-B Milwaukee Universal

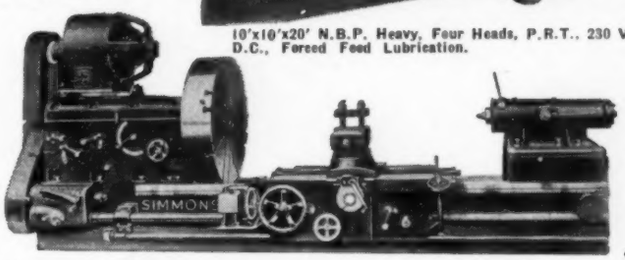
BORING MILLS
24" Bullard, New Era
62" Niles 1-swivel, 1-turret
84" Cincinnati 2-swivel heads
12' Betts 2 swivel heads

12' N.B.P. 2 swivel heads
16-24' Niles extension type
3" spindle Universal Tri-Way
No. 33 Lucas table type
4½" spindle No. 33 Lucas
6" spindle Jones Hi-Speed

GEAR HOBBERS
150" Muir, 102" Table
100" G & E, 84" Table
84-H Gould & Eberhardt
Biernatzki, 30" capacity
48"x10" B & S Spur Cutter



10'x10'x20' N.B.P. Heavy, Four Heads, P.R.T., 230 V., D.C., Forced Feed Lubrication.



48"x40' Simmons Heavy Screw Cutting Engine Lathe, Geared Head for A.C. or D.C. Motor Drive.

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VALUES IN USED MACHINE TOOLS

5¼" Gridley Sgl. Spdl. Automatic
2 Spdl. Walker T. Drills
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CA-4 Ferracute Horn Press, 35 Ton Cap.
No. 44-P Toledo Horn Press, Arr. for Grd., M.D.
No. 16 Bliss Horn Press, Vee Belt, M.D.
Nylint Dbl. End Gage Grinder, M.D.
No. 1 Wilmarth & Morman Surface Grinder, M.D.
No. 33 Abrasive Surface Grinder, M.D., Chuck & Rectifier
No. 1-B Milwaukee Plain Mill, Sgl. Pulley, M.D.
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42"x15' American Geared Head Lathe
2½"x18" Model B Cleveland Automatic
No. 2G B & S std. speed Automatics

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#2 B & S Plain and Universal Millers
Standard Automatic Drop Hammers, all sizes
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#3 B & S Spur Gear Cutters
#2 Cincinnati Centerless Grinder, late model
3' and 4' Late Model Radial Drills

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¼"	$.50 each net
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¾"	.50 each net
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1½"	.50 each net
2"	.50 each net
2½"	.50 each net
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#11 Armstrong Bitch Dogs, opens to 1½"	.50 each net

12" Combination Squares with Bevel Protractors complete, Millers Falls, **$4.50** ea.

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3'11" CANEDY-OTTO — RADIAL — 220/3/60/1800 — LATE TYPE — 1942 Mfg.
3'9" AVEY — Sensitive — RADIAL — Belt Drive.
21" CANEDY-OTTO — BG — Upright — #4MT — PF to spdle. — V-belt Drive — NEW.
16" SIPP — 4 spdle — Sensitive — #2MT —Belt Drive.
16" ALLEN — 4 spdle — Sensitive — #2MT — Belt Drive.
16" CANEDY-OTTO — Floor and Bench — Sensitive — ½" chucks — 110/1/60 — NEW.
16" AVEY — Floor — 2 spdle — Sensitive — Belt Drive.

GRINDERS

10"x24" LANDIS — Universal — Hyd. — 220/3/60 — Type C — 1944 Mfg. — Used 3 months.
12"x48" CINCINNATI — Universal — Hydraulic — 550/3/60 — LATE TYPE — 1942 Mfg.
#2 CINCINNATI — Tool & Cutter — 220/440/3/60 — Universal — Large assortment of accessories — LATE TYPE — 1941 Mfg.
9"x20" DO-ALL — Hydraulic — Surface — with elec. chuck — LATE TYPE.
7"x11" LEACH — Plain Cylindrical — M.D. — 220/3/60 LATE TYPE — 1942 Mfg.
#2 BROWN & SHARPE — Surface — 6x18 — hand feed — MD — 220/440/3/60 — 1943 Mfg.
6"x18" MONARCH — Surface — Hand feed — XL0 mtzd. Spdle — 550/3/60 — with chuck.
#60 HEALD — Cylinder.
#TG-12 GRENBY — Internal — High Speed — PF — LATE TYPE.
10"x48" MAJESTIC — Cylindrical — 220/3/60 — mtzd. work head — mtzd. wheel head pump — piping — LATE TYPE — 1943 Mfg.
10"x24" NORTON — Cam Grinder — Mtzd.
#13 BROWN & SHARPE — Universal — Tool & Cutter — Wet. attachment — Cabinet — Lg. assort. of access. — LATE TYPE — 1942 Mfg.
6"x32" NORTON — Plain Cylindrical — MD — 220/440/3/60.

LATHES & TURRETS

16"x6' SEBASTIAN — Type R — 8 speed — Geared Head — Timken. Spdle. — NEW.
20"x54" REED-PRENTICE — 16 speed — Geared Head — Taper Attach. — 220/440/3 — with additional equipment — LATE TYPE — 1942 Mfg.
14"x30" LODGE & SHIPLEY — 12 speed — motor in base — TA — chuck — steps — 4 way tool post — 220/440 — other equipment — 1941 Mfg.
14"x6' HENDEY — Geared head — factory MD — chucks — less mtr.
16"x6' HENDEY — QCG — Taper attachment — Chuck — Collets — MD.
#5 JONES & LAMSON — Universal Turret — LATE TYPE — 1943 Mfg.
#3 JONES & LAMSON — Universal Turret — 220/3/60 — with bar feed and chucking — LATE TYPE — 1943 Mfg.
#2 BARDONS & OLIVER — 1" — Universal Turret — with bar feed — LATE TYPE.
#2 WARNER & SWASEY — PF to turret — Cross slide — BD — arr. MD.

MILLING MACHINES

#3K K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base — LATE TYPE — 1943 Mfg.
#3H K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base — LATE TYPE — 1942 Mfg.
#2K K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base — LATE TYPE — 1943 Mfg.
#3 CINCINNATI — Dial Type — Plain Horizontal — Power rapid traverse — 220/3/60 — LATE TYPE — 1942 Mfg.
#2I GARVIN — Plain Horizontal — Belt drive.
#1 ROCKFORD — Plain Horizontal — Drive — All MD — 3 Tee Slot.
I GARVIN — Hand — Lever feed table — Belt drive — Stationary spdle.
#34 OHIO — "Osterlein" — Universal — Belt drive — New dividing heads.
#2—24 CINCINNATI — Rise and fall — LATE TYPE — 1942 Mfg.
#3H K&T "Milwaukee" — VERTICAL — Power rapid traverse — Power feed to head — Motor in base — LATE TYPE — 1942 Mfg.
#2H K&T "Milwaukee" — VERTICAL — Power rapid traverse — Power feed to head — Motor in base — LATE TYPE — 1942 Mfg.
#5 BECKER — Vertical — Belt drive — Motor bracket — 12x48" table.
#2 BROWN & SHARPE — Plain Horizontal — Light Type — 200/440/3/60 — LATE TYPE.

PRESSES

DP53 FERRACUTE — 40 ton — SS — Motor driven — 220/3/60 — Plain — With side shear — 1940 Mfg.
#3K PERKINS — Screw — NEW.

SAWS

#4C COCHRAN-BLY — Cold — inserted tooth blade — MD — 220/3/60.
8x16 KALAMAZOO — Metal Cutting band — —110/1/60 — Motor — Equipment — Contour sawing attachment — NEW.

SCREW MACHINES

#0G BROWN & SHARPE — Fully automatic — Vertical slide attachment — Serial No. 7500.
#00G BROWN & SHARPE — Fully automatic — Serial No. over 17,000 — Motor driven slotting attachment — LATE TYPE — 1943 Mfg.
#00G BROWN & SHARPE — Fully automatic — Serial No. over 11,000 — Motor driven slotting attachment — Swing stop and equipment — LATE TYPE.
#R4 NATIONAL ACME — 4 spdle — Fully automatic — 3½" cap. — 220/440/3/60 — complete assortment of equipment — LATE TYPE.
#0 BROWN & SHARPE — Fully automatic — Belt drive.
#R NATIONAL ACME — 4 spdle — Fully automatic — 1⅜" cap. — LATE TYPE — Extra equipment.
2" GREENLEE — 6 spdle — Fully automatic — Motor driven — LATE TYPE — 1942 Mfg.

SHAPERS

16" GEMCO — "Lubrigard" — 220/3/60 — Power rapid traverse — Heavy duty — NEW.
28" AMERICAN — Back geared — Power feed to head — Single pulley drive.
32" GOULD & EBERHARDT — Universal — "Industrial" — Heavy Duty — Late Type — Mfg. 1942.
24" GOULD & EBERHARDT — Crank — Motorized with 4 speed drive.
7" LOGAN — Floor type — 110/1/60 — NEW.

SHEARS

36" PEXTO—Power squaring—Motor drive—16 ga.
42" WHITNEY — Power squaring motor drive — 220/3/60 — 16 gauge — NEW.

MISCELLANEOUS

DIE FILER — Harvey "Butterfly" — Model EL — 110/1/60 — LIKE NEW.
PLANER — Woodward & Powell — 60"x60"x12' — 2 rail heads — 1 side head — Box bed.
PLANER—Woodward & Powell—48"x48"x14'—MD
PLANER — Woodward & Powell — 30"x30"x12' — 2 rail heads — 2 side heads — Down feed and elevation — Box bed — BD.
PLANER — Whitcomb — 24"x24"x6' — Arr. for motor drive — Less elec. equip. — 1 rail head.
PUNCH & SHEAR — Williams & White — 3" cap. — Wt. approx. 30,000#.
HAMMER — Bliss — 300# — Board drop.
CLUTCH CUTTERS — Waltham.
PROFILER—Pratt & Whitney—#13—Gear driven.
SUPERFINISHER — Foster.
GEAR CUTTER — Brown & Sharpe — #6 — 72" spur.

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34 HERMAN STREET — WORCESTER 8, MASS.

SURPLUS EQUIPMENT

AVAILABLE FOR IMMEDIATE DELIVERY

#3 Waterbury-Farrel punch press, capacity 20 ton stroke 2½", ram adjustment, 60 strokes per minute, shut height, 6½", bed size F to B 10½", R to L 14½".....$475.00

#6600 Waterbury-Farrel punch press, cap. 56 ton, vertical back geared, open back, straight sided stroke 6", 60 strokes per min., 20" shut height, distance between uprights —46", bed size 10"x45", 5 HP motor, push button switches, V drive.....$1750.00

#13M Marshalltown throatless shear with circle shearing attachment for serpentine sheet metal steel shearing to 12 ga. with 1 HP motor 220/3/60.....$350.00

#2 Cincinnati Centerless Grinder, filmatic spindle late model, Ser. #2M-2H1L9 .....$2750.00

#5 Waterbury-Farrel blanking & cupping press $380.00

#35P Toledo punch press, gap type, flywheel 48"x7", bed size 27"x18", stroke 1¾", 15" from bed to bottom of rain ways, motor rack, not motorized. Pitman strap and eccentric just rebuilt.....$1500.00

Model RA-6, six-spindle Acme-Gridley automatic, 9/16" bar cap., including tooling and equipment, serial #22377A, practically new $3950.00

Spot welder, 75 KVA gun type with air control, model SIDS5, serial #2801, Progressive $650.00

BILLARD MACHINE & TOOL CO.
PHONE 44 — MANSFIELD, PA.

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LATHES

20"x8' L&S Grd. Hd., AC mtr. in leg
20"x8' HENDEY Grd. Hd., AC mtr. in leg
24"x14' L&S Uni-Drive
36"x20' L&S Selec. Grd. Hd., AC MD

MILLERS

#2M CINCINNATI Plain, AC MIB
#3B B&S Plain, DOA, PRT, AC MIB
#4B B&S Plain, DOA, PRT, AC MIB
#14 COCHRANE-BLY Univ. Vert. & Shaper, AC MD
#4B MILWAUKEE Plain, arr. MD, DOA, PRT

PLANERS

36"x36"x8' GRAY, arr. MD
24"x24"x6' CINCINNATI Planer, AC MD
42"x42"x10' LIBERTY Openside Planer, AC MD

GRINDERS

#72A2 HEALD "Sizematic" Internal, AC MD
#2 BROWN & SHARPE Univ., arr. AC MD
#22 HEALD Rotary, AC MD
#51 OLIVER Drill, AC MD
16"x72" LANDIS Plain, Self-Cont.

MISCELLANEOUS

24"x36" BULLARD "New Era" VTL's, AC MD
#12 BARBER-COLMAN Gear Hobbers
6' CINCINNATI-BICKFORD Radial Drill, Mtr. on arm
7' DRESES Radial Drill, gearbox, AC MD
#3A W&S Univ., AC MD, covered ways
10" P&W Vert. Shaper
12'x10 ga. OHL Press Brake
#34 B&S Gear Hobber, AC MD
#8-DT POTTER & JOHNSTON Auto. Chucking & Turning Machine

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Used 7 to 10 ft. Betts Vertical Boring Mill, Belt drive, two swivel heads, swing 126", maximum height under tool holder 58". *Now in service. Inspection invited. Write*

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Clearfield, Pa.

NEWTON COLD SAW 32"

Capacity 12" diameters. 2 Motors Variable Speeds, Q. C., 3/60/220-440 Feed Table. Wt. 8500 lbs. *Latest Model.*

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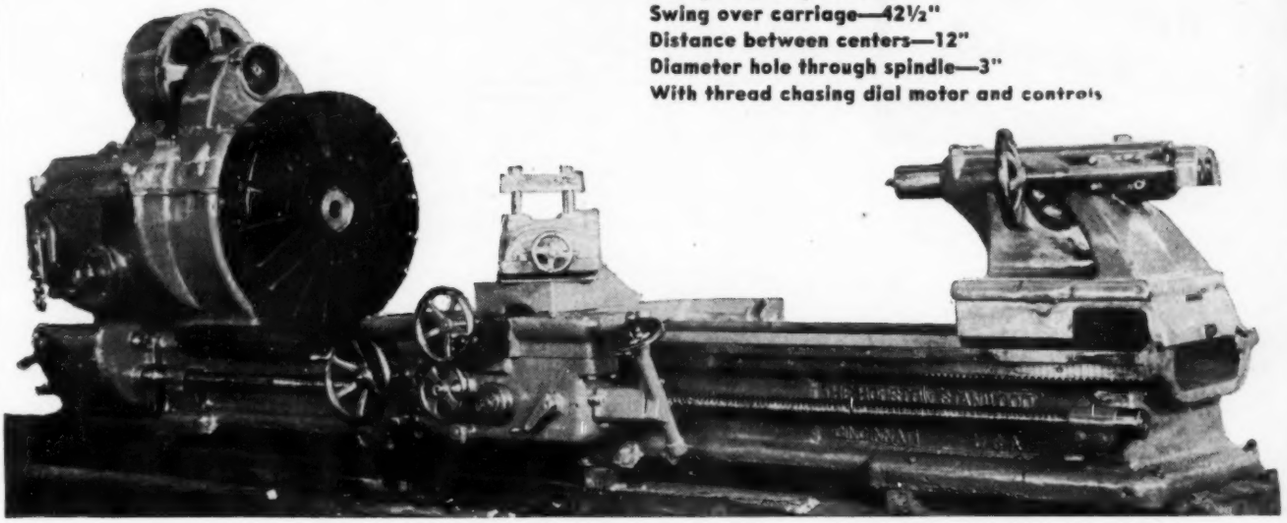
EMERMAN Offers From Stock

Heavy Duty Engine Lathe

54" x 18' HOUSTON STANWOOD & GAMBLE

Swing over ways—54"
Swing over carriage—42½"
Distance between centers—12"
Diameter hole through spindle—3"
With thread chasing dial motor and controls



16' x 24' NILES BEMENT POND EXTENSION TYPE BORING MILL
2000 TON HPM. FASTRAVERSE HOBBING PRESS
NO. 2 MEDART-HUFF BAR & TUBE STRAIGHTENER

EMERMAN MACHINERY CORP. 875 W. 120TH ST. CHICAGO 43, ILL.

PRESSES

STRAIGHT SIDE—60 ton, 5" stroke, 48x24 bed, late model Waterbury Farrell (15).
90 ton, 8" stroke, 50x18 bed, Bliss (3).
200 ton, 32" stroke, 27x27 bed, Bliss
100 ton, 4 stroke, 21x21 bed, 15½" shut height, Bliss
70 ton, 4" stroke, 22x22 bed, 15" shut height, Toledo.
35 ton, 4, 5, 6" stroke, latest type, pract. new, w/all accessories, Bliss, $850.00 ea.
100 ton, 4" stroke, 21x27 bed, 110 strokes per min., Bliss.
115 ton, 4" stroke, 21x26 bed, $2250.00 (3).
INCLINABLE PRESSES, BRAND NEW — #21 ½A Bliss, brand new, w/cushions, 6" stroke, 18" shut height (3).
#5 Federal, brand new, 4" stroke, 38¼"x8" bed.
55 ton Walsh, brand new, 3½" stroke, 9" shut height.
15 ton, new $363.00; 4½ ton, new, $165.00.
HORN—50 ton, Bliss, 4½" stroke.
40 ton, Consolidated, 2" stroke.
35 ton, Toledo, 2" stroke.
5 ton Bliss, 1½" stroke.

AUTOMATICS

1⅝" Acme Gridley, 8 spdl. latest type (2).
2¼" Cone, 6 spdl., latest type (4).
10" 8 spdl. Bullard Multaumatics, pract. new, $9000.00 ea. (5).

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10'x⅛" Henderson Power Press Brake, 30 HP motors and controls. Just taken out of operation.

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NEW — H.S. STEEL • FIRST QUALITY

INVOLUTE 1P to 48P } *ALL LISTED*
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BLAKESLEE DEGREASER

Type TE-LL, Liquid-Vapor or Liquid-Liquid operation, by steam at 10# pres. steam coils on clean-out doors, cap. 3000# per hr.

BRAND NEW HOISTS or WINCHES

200—1½ ton Hand Cranked Hoists ratio 27:1 thru double reduction gear unit with 4 planetary gears. Can furnish with A.C. or D.C. Motors.

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Pittsburgh (6) Pennsylvania

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New Brit. Grid. No. 412 Auto. Chuckers (3)
Flash Welder—Swift—150 KVA
Roll Former—Farnham—12'
Rigid Turner 8 sp.
Lees-Bradner Model 40 Thread Millers
P&W—2 sp. Hor. Deep Hole Drill
Lapping Machines, Ultra Lap No. 20 (4)
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Turret Lathes, Denver Acme Model 6.2 (6)
Engine Lathe, 48"x32' Niles

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Six #000 Brown & Sharpe Brand New, Original Crates With 220 Volt 60 Cy. 3 Ph. Motors.

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96", 12 gauge capacity
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NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

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B. D. BROOKS, INC.
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VALUES GALORE RIGHT ON OUR FLOOR

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1—Bradford 12"x6' Lathe, New, 12 speed, timk. bear., grd. hed., motor in base, latest type.

L. & S. 27½"x16' Eng. Lathe, sw. overways 28", sw. over carr. 19½", dist. betw. cens. 10', diam. of tailstock 3½", dbl. bk. grd., motor driven.

MILLERS

2—B. & S. #2A Univ. Mill. Machines; tbl wkg. surf. 45"x11¼"; feeds-long. 28", cross 10", vert. 18".

B. & S. #8A Univ. Mill. Machine, motor in base tbl. overall 57½"x13¼", feeds long. 34", cross 12", vert. 19".

PRESSES

1—Toledo No. 666 Knuckle Jointed Embossing and Coining Press, capac. 1000 Ton, stroke 2", shut height 18", width betw. uprights 32", width between gibs 25", wght. approx. 90,000 lbs.

Billings and Spencer #2 Trimming Press, complete cut-off slide, stroke 4", daylight 18½", dist. betw. uprights 26".

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1—B. & S. 1, 2, 3, and 4 Univ. Cyl. Grinders, capac. 10"x20" (No. 1), 14"x30" (No. 2), 14"x40" (No. 3), 14"x60" (No. 4) very latest type.

1—B. & S. No. 13 Univ. & Tool Grinding Machine, latest type, cens. sw. 8, dist. betw. cens. 24", long. tbl. trav. 22", with attmts.

SHAPERS

1—Gould & Eberhardt 16" Hi-Duty Crank Shaper, B.G. through gear box M.D., vert. move of tbl. 15", planes width 21".

1—Hendey 20" Crank Shaper, stroke 20¾", strokes per min. 8-115, horiz. trav. 24½", vert. trav. 15".

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Bradley 150 lb. Strap Hammer and 300 lb. Upright Helve Hammer.

1—Billings & Spencer 1000 lb. Board drop type.

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Botwinik Brothers
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COMPLETE FORGE SHOP

Including 72"x18' 150# Working Pressure Boiler, 3300# Chambersburg Single Frame Hammer, three forging furnaces, cranes, tools, pumps, blowers, etc. May be inspected now in operation. *Call, write, or wire M. G. McCool.*

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OKLAHOMA CITY

LATE MODELS OF MACHINE TOOLS FOR EARLY DELIVERY

BORING MILLS

42" BULLARD Vert., M.D. Spiral Drive
#25A DEFIANCE Table Type Horizontal, M.D.
#360-F GIDDINGS & LEWIS, Floor Type, M.D.
#560-F GIDDINGS & LEWIS, Floor Type, M.D.
#44 UNIVERSAL Tri-Way, Table Type.

GRINDERS

#2 B&S Surface, M.D.
#2 REID Surface, M.D.
#10 B&S Tool & Cutter, M.D.
#72A3 HEALD Plain & Sizematic, M.D.
#4T SELLERS Tool Grinder, M.D.
9" P&W Hyd. Gear Grinder, M.D.
#11 BLANCHARD Rotary, 16" chuck
4—#4H LANDIS 4"x18" Plain Grinders, M.D. with hyd. straight infeed, hyd. timer & hyd. footstock.
6"x30" NORTON Type "G" Plain Cyl.
24"x96" NORTON Plain, M.D.

LATHES

AMES Precision Bench Lathe, 1" collet cap., M.D.
12" & 14"x30" LODGE & SHIPLEY G.H. Lathe, M.D.
14"x30" LEBLOND HVY DUTY, M.D.
16"x54" LEBLOND HVY DUTY, M.D.
16"x6' SEBASTIAN Lathe, M.D.
50"x17" centers LEBLOND "BIG SWING" Lathe, M.D.

MILLING MACHINES

#5/60 CINCINNATI, Duplex Hydromatic Milling Machine, tracer control mechanism for automatic rise & fall of spindle carriers, M.D. machine used six months.

#12-24 K&T Simplex, M.D.
#1G & 2G KEMPSMITH All Geared Univ., M.D.
#12 VAN NORMAN Universal Miller, M.D.
#2H K&T Vertical, Power Feed, M.D. (3)
#2MS CINCINNATI Dial Type, Plain, M.D.
#4MS CINCINNATI Dial Type, Plain, M.D. (2)
#2HS CINCINNATI Dial Type, Vert., M.D.
#4K K&T Vertical
#12 B&S Prod. Mills, M.D.
#M-50A TAYLOR & FENN Vert., M.D.
#12M MOREY 2-spdle PROFILER, M.D.
#12B P&W 2-spdle PROFILER

TURRET LATHES

#0 B&S Wire Feed Screw Machine, M.D.
#2G MOREY Ram Type, M.D.
Nos. 3, 4, & 5 W&S Ram Type Univ., M.D.
Nos. 3 & 5 J&L Ram Type Univ., M.D.
#4A W&S Saddle Type Univ., M.D.

DRILLS

6-spdle ALLEN Drill, M.D.
3'9" CINCINNATI BICKFORD "Super Service" Radials (3)

MISCELLANEOUS

#36H GOULD & EBERHARDT Gear Hobber.
Used Bases for 4' & 6' CINCINNATI BICKFORD Radials
#4—48" B&S Gear Cutter
40"x32"x51" OHIO Tilting & Revolving Rotary Table for Horizontal Boring Mill
14" Steptoe Shaper, V-belt, M.D.
V-16 DOALL Contour Saw, M.D.

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STOCK TOOLS — *Prompt Shipment*

AIR COMPS., 50, 130, 220 & 350 c.f., 100#
AUTOMATICS 3½" Cone 4-Spindle (4)
BOLT CUTTERS, dbl. head, 1", 1½" & 2"
BOR. MILLS, 2½" bar, Cleveland, M.D.
BORING MILLS, 3" bar Universal
BORING MILL, Hor. 3½" Landis Floor Type.
BORING MILL, 36" Bullard, "New Era"
BORING MILL, 36" King, 2 heads, M.D.
DRILL, Radial 6' Carlton, M.D.
GEAR SHAPER, #75 Fellows, M.D.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr. Hyd.
GRINDER, Plain 14"x72" Norton
GRINDERS, Surf. Nos. 3 & 5 Abrasive
GRINDER, Surface, No. 25 Heald Rotary
HAMMER, Pneu., No. 6B Nazel, M.D.
LATHE, 20"x12' L & S, 12 Speed, Grd. Hd.
LATHE, 24"x18' B & E Grd. Hd.—1940
LATHE, 27"x18' Niles "Timesaver," Grd. Hd.
LATHE, 38"x19' Putnam, Grd. Hd. Q.C.G., T.A.
MILLER, Plain, Nos. 3S, 4 & 5 Cincinnati.
MILLER, Thread, No. 40 Lees-Bradner
MILLER, Univ., No. 4 Cincinnati, B.D.
MULT-AU-MATICS, Bullard Type A, 6 Spdle.
SHAPER, 24" Stockbridge, M.D.
SHAPER, 32" Smith & Mills, M.D.
SHEAR, Plate, 84"x¼" Canton, M.D.

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28th St. & A.V.R.R. Pittsburgh, Pa.

FOR SALE

Columbia all steel gap shears (new), 12'x3/16"x18" gap, 10'x3/16"x18" gap, 6'x¼"x18" gap.

Columbia all steel power press brakes (new) 10'x 3/16", 8'x¼", 6'x¼".

Double Crank Presses (new) straight side tie rod construction 100, 150, 200, 250, 300 tons.

O.B.I. Presses (new) 6 to 90 tons. Flywheel, geared.

(4) Bliss #78½ 350 tons 18" stroke, 44" shut height, bed 36"x36", Bolster 24" thick.

Pneumatic cushion in bed. Friction clutch, air operated, motorized.

(3) Bliss #304 55 tons—9" stroke, adj. 2½", shut height 12", bed area 17"x17". Bed accommodates Pneu. cushions, motorized.

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Because of the Holiday, New Year's Day, January 1st, the "Searchlight" pages of the

January 15th Issue of

AMERICAN MACHINIST

Close for press earlier than the usual weekly closing time.

The cooperation of advertisers is solicited in forwarding new copy, or changes of copy, to reach us accordingly.

FINAL CLOSING TIME
Display and Undisplayed Ads
Monday, 10 A.M., December 29th

INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives 24-25, 26-27, 128, 159, 183

Accessories & Attachments (Machine Tool).....141, 192

Arbors & Mandrels.....188

Bearings.....16, 28, 145, 163, 172

Bending Machines.....166

Books, Technical.....160, 170, 178, 190

Boring, Drilling & Milling Machines (Horizontal).....2nd Cover, 4-5, 10-11, 18-19, 34, 38-39, 66, 177, 192

Boring & Turning Machines (Vertical).....41, 177, 192

Broaching Machines.....51

Casters & Wheels.....158

Centering Machines.....18-19, 166

Centrifugal Machines.....168

Chucks 170, 180, 184

Cleaning & Drying Machines & Supplies 139

Collets 176

Counters 32

Coolant Systems, Filters & Supplies....186

Cut-Off Machines; Sawing Machines 50, 166

Die Casting Machines.....52, 188

Dressers, Grinding Wheels.....178

Drilling Machines....17, 18-19, 20, 21, 33, 40, 61, 157, 164, 174, 180, 184, 192, 193-194, 198

Engineering & Production Services.....62

Exhibits 165

Fasteners.....137, 143, 188

Finishing Machines.....48

Gages & Instruments.....36, 57, 121, 122, 152, 176, 182, 192, 195

Gear Cutting Machines....3, 6-7, 169, 175, 204

Gears, Speed Reducers, Motor Reducers...16, 31, 64, 154, 167, 173, 174, 175, 178

Grinders—Cutter & Tool.....55, 182

Grinding Machines—Production 8-9, 14-15, 42, 53, 177, 179, 193-194, 201

Heads: Drilling, Grinding & Tapping..168

Heat Treating Equipment & Supplies..183

Honing Machines.....162, 203

Insurance 185

Jig Borers.....20, 30

Lathes, Automatic.....18-19, 59

Lathes, Engine.....56, 131, 187, 204

Lathes, Turret.....35, 44, 54, 59

Lubricants, Cutting Fluids, Quenching Oils, Rust Preventives.....170, 186, 198

Lubricating Systems & Equipment.....198

Marking Machines & Tools.....202

Materials, Cutting & Forming.....60

Materials of Manufacture....4th Cover, 45, 124, 133, 146, 149, 151, 191, 196

Millers, Die Sinkers, Profilers..4-5, 10-11, 38-39, 161, 166, 192

Parts & Equipment, Hydraulic & Pneumatic 18-19, 190, 199

Parts & Equipment, Mechanical.....46-47

Photographic Service, Materials.....174

Planers 34, 58

Plastic & Rubber Molding Machines...168

Power Transmission.....16, 189

Presses, Forging & Forming Equipment & Supplies....29, 126, 147, 154, 176, 179, 180, 183, 197, 198

Production, Inventory & Tool Control..156

Riveting Machines.....182, 183

Screw Machines; Chucking Machines.....3rd Cover, 37, 186

Shapers, Slotters, Keyseaters..68, 180, 198

Special Machine Tools.....184, 192, 198

Steel Blue.....192

Swaging Machines.....198

Tapping Machines.....160, 181, 188, 198

Threading Machines.....12-13, 14-15, 184

Tooling Set-Up Equipment.....63

Tools, Cutting.....22-23, 43, 49, 135, 148, 153, 171, 179, 180, 183, 184, 188

Wiping Cloths 150

ADVERTISERS INDEX

	Page
Adams Company	31, 184
Air Hydraulics, Inc.	176
Ajax Manufacturing Co.	126
Allen Manufacturing Co.	188
Almond Mfg. Co., T. R.	184
Aluminum Co. of America	45
American Screw Co.	137
American Society of Tool Engineers	165
American Tool Works Co.	21
Amer. Wheelabrator & Eqpt. Corp.	139
Ampco Metal, Inc.	196
Anton Machine Works	182
Armstrong-Blum Manufacturing Co.	50
Armstrong Brothers Tool Co.	63
Atlantic Gear Works	173
Auto Engine Works, Inc.	175
Avey Drilling Machine Co.	33
Barber-Colman Co.	43
Barrett Co., Leon J.	168
Baumbach Manufacturing Co., E. A.	180
Bay State Abrasive Products Co.	159
Bijur Lubricating Corp.	198
Bilgram Gear & Machine Works	174
Black Drill Co.	179
Blake Co., Edward	182
Blanchard Machine Co.	42
Brad Foote Gear Works	175
Braun Gear Co.	175
Brown & Sharpe Mfg. Co.	57
Bryant Machinery & Engrg Co.	20
Canedy-Otto Mfg. Co.	17
Carboloy Co.	153
Carlton Machine Tool Co.	180
Chandler Tool Co.	180
Chicago Manufacturing & Distributing Co.	186
Cincinnati Bickford Tool Co.	40
Cincinnati Gear Co.	173
Cincinnati Grinders Incorporated	8, 9
Cincinnati Milling Machine Co.	4, 5
Cincinnati Planer Co.	58
Cincinnati Shaper Co.	68
Clearing Machine Corp.	147
Cleereman Machine Tool Co.	20
Cleveland Twist Drill Co.	49
Columbus Die Tool and Machine Co.	184
Consolidated Machine Tool Corp.	55
Curtis Pneumatic Machinery Co.	190
Dahlstrom Mfg. Co.	160
Danly Machine Specialties, Inc.	29
Darnell Corporation	158
Davis & Thompson Co.	192
Davis Keyseater Co.	180
Dayton Rogers Mfg. Co.	179
Denison Engineering Co.	197
DeVlieg Machine Co.	30
Dumore Co.	193, 194
Dykem Co.	192
Eastern Machine Screw Corp.	184
Employers Mutual Liability Ins. Co. of Wisconsin	185
Errington Mechanical Laboratory	170
Ex-cell-o- Corporation	177
Falk Corporation	46, 47
Fellows Gear Shaper Co.	6, 7
Fitzsimons Co.	124
Fosdick Machine Tool Co.	61
Gallmeyer & Livingston Co.	179
Ganschow Gear Co.	173
Gates Rubber Co.	189
General Electric Co., Plastics Div.	178
Gisholt Machine Co.	48
Gleason Works	3
Goss & deLeeuw Machine Co.	186
Grant Gear Works	174
Grant Mfg. & Machine Co.	183
Gray Co., G. A.	34
Hamilton Tool Co.	188
Hartford Special Machinery Co.	173
Heald Machine Co.	2nd Cover
Hendey Machine Co.	187
Henry & Wright Mfg. Co.	176
Holman Reamer Co.	183
Hones, Inc., Charles A.	183
Hypro Tool Co.	171
J & S Tool Co.	178
James Mfg. Co., D. O.	174
Jones & Lamson Machine Co.	35
Kearney & Trecker Corp.	38, 39
Kelley Gear & Tool Co.	173
Kent-Owens Machine Co.	161
Kex National Service	150
King Machine Tool Co.	41
L. W. Chuck Co.	192
Landis Machine Co.	12, 13
Landis Tool Co.	14, 15
Langelier Mfg. Co.	198
LaPointe Machine Tool Co.	51
Leland-Gifford Co.	174
Link Belt Co.	16
Linley Brothers Co.	182
Lodge & Shipley Co.	44, 131
Luers, J. Milton	184
Lufkin Rule Company	152
MacMillan Co.	160
Mahon Co., R. C.	62
Mattison Machine Works	201
McCaskey Register Co.	156
McGraw-Hill Book Co., Inc.	170, 178
Meisel Press Mfg. Co.	174
Metal Carbides Corp.	60
Micromatic Hone Corp.	162
Midvale Company	151
Mill Supplies	200
Monarch Machine Tool Co.	141
Monarch Steel Co.	124
Morris Machine Tool Co.	66
Morse Twist Drill & Machine Co.	22, 23
National Acme Co.	37
National Machinery Co.	181
National Machine Tool Co.	198
Newark Gear Cutting Machine Co.	175
New Britain Gridley Machine Co.	3rd Cover
Nicholson & Co., W. H.	188
Noble & Westbrook Mfg. Co.	202
Norma-Hoffmann Bearings Corp.	172
Norton Company	24, 25
Ohio Gear Co.	167
Oliver Instrument Co.	188
Parker Appliance Co.	199
Peninsular Grinding Wheel Co.	26, 27
Permanente Products Co.	149
Photographers' Assn. of America	174
Pines Engineering Co., Inc.	166
Potter-Johnston Machine Co.	59
Pratt & Whitney Div. Niles-Bement-Pond Co.	52
Precision Gear Co.	173
Production Machine Co.	168
Red Wing Motor Co.	182
Reeves Pulley Co.	64
Revere Copper & Brass, Inc.	133
Reynolds Metals Co., Inc., Aluminum Div.	191
Ryerson & Sons, Inc., Jos. T.	146
S.K.F. Industries, Inc.	145, 163
Sales Service Machine Tool Co.	154
Scully Jones & Co.	135
Severance Tool Industries, Inc.	188
Sewall Mfg. Co., E. B.	154
Sheffield Corp.	121
Sheldon Machine Co., Inc.	204
Shore Instrument & Mfg. Co., Inc.	192
Sibley Machine & Foundry Corp.	164
Sidney Machine Tool Co.	56
Simonds Abrasive Co.	128
South Bend Lathe Works	157
Stahl Gear & Machine Co.	204
Stuart Oil Co., Ltd., D. A.	198
Sundstrand Machine Tool Co.	18, 19
Sunnen Products Co.	203
Sweets Catalog Service	190
Taft-Peirce Mfg. Co.	169
Thompson Grinder Co.	53
Thriftmaster Products Corp.	168
Timken Roller Bearing Co.	28
Timken Roller Bearing Co. (Steel & Tube Div.)	4th Cover
Tinnerman Products, Inc.	143
Tuthill Pump Co.	186
United Precision Products Co.	176
V. & O. Press Co.	183
Van Keuren Co.	36
Van Norman Co.	10, 11
Veeder-Root, Inc.	32
Vitrified Wheel Co.	183
Waltham Machine Works	204
Warner & Swasey Co.	54
Webber Gage Co.	122
Weldon Tool Co.	148
White & Bagley Co.	170
Woodworth Co., N. A.	180, 195
Zeh & Hahnemann Co.	180

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT
- Positions Vacant 205
- Positions Wanted 205, 206
- Employment Services 205

SPECIAL SERVICES
- Contract Work 205
- Alma Motor Co. 205
- Buehrle, Philip H. & Son, Inc. 205
- Dayton Rogers 205
- General Grinding Co. 205
- General Pattern Works 205
- Metonic Corp. 205
- Universal Thread Grinding Co. 205

BUSINESS OPPORTUNITIES
- Offered 206

NOTICES
- Auction 206

EQUIPMENT
(Used or Surplus New)
- For Sale 206-216

WANTED
- Equipment 206

ADVERTISERS INDEX

Aaron Machinery Co.	208, 210, 212, 215
American Iron & Machine Works Co.	216
Bennett Machinery Co.	210
Billiard Machine & Tool Co.	214
Botwinik Bros. of Mass. Inc.	216
Botwinik Bros Inc.	212
Brooks Inc., B. D.	215
Brownell, Hazard	212
Clearfield Machine Co.	214
Continental Salvage & Machinery Corp.	215
Cox Machinery Co.	214
Cuny-Ravet, L.	206
DeWitt Tool Co.	215
Dony Machinery Co.	213
Duquesne Electric & Mfg. Co.	215
Eastern Machinery Co.	211
Emerman Machinery Corp.	215
Falk Machinery Co.	207
Freeman & Co., Samuel T.	206
Hackett Co., J. Lee	206
Hill-Clarke Machinery Co.	203
Hyman & Son, Joseph	210
Indianapolis Machinery & Supply Co.	210
Kaddis Screw Products Co., Inc., A. G.	216
Katolight	206
Kings County Machinery Exchange	214, 216
Lang Machinery Co.	216
Macomson Machine Co.	206
Michigan Steel Tube Products Co.	206
Miles Machinery Co.	210
Morey Machinery Co.	209
National Machinery Exchange Inc.	212
Oldach Co., Inc., E. M.	215
Osborne & Sexton Machinery Co.	200
Ott Machinery Co.	213
Paul's Machinery Co.	215
Revere Copper & Brass Inc.	206
Reynolds Machinery Co.	213
Sheridan Iron Works, The	206
Schill Corp., Franklin Edward	216
Sier-Bath Gear & Pump Co., Inc.	216
Simmons Machine Tool Co.	213, 216
United Machinery & Tool Corp.	214
Victor Machinery Exchange	213
War Surplus Eng. Co.	214
Westbrook Elevator Mfg. Co.	206
West Penn Machinery Co.	210
Whaley Engineering Corp.	206
Wigglesworth Machinery Co.	216

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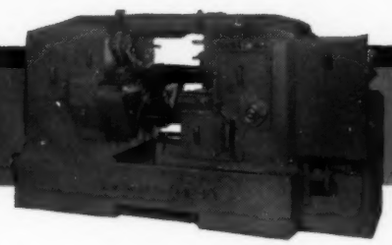

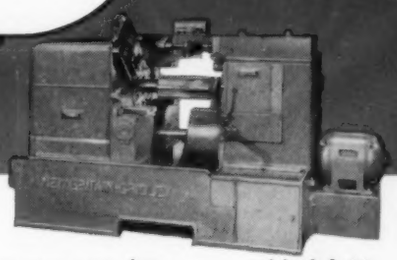

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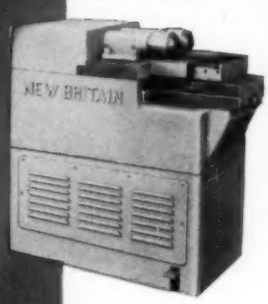

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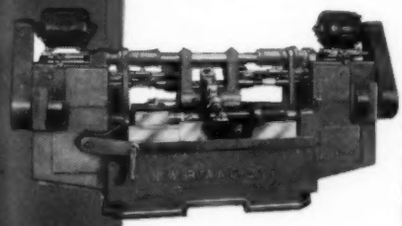

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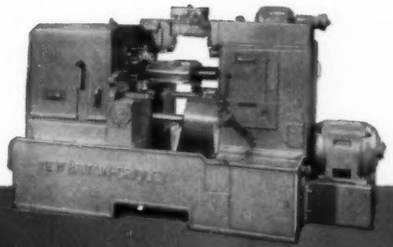

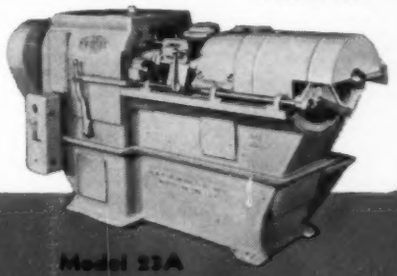

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